FACET

DRAINAGE MEMORANDUM – REV 2

TO: City of Mercer Island

FROM: Ben Iddins, P.E.

DATE: July 19, 2024

RE: 6520 82nd Ave SE, Mercer Island, WA
On-site Drainage System Design Summary

Digitally signed by Ben Iddins
Date: 2024.07.19 16:15:29 -07'00'

This memorandum summarizes the drainage system design in accordance with the 2019 edition of the Washington State Department of Ecology Stormwater Management Manual for Western Washington and the City of Mercer Island Drainage Requirements (the combination of which is hereafter referred to as "the Manual").

1 PROJECT SUMMARY

The site at 6520 82nd Ave SE on Mercer Island totals 15,178 square feet and will involve a substantial remodel of the existing single-family residence with the existing foundation to be reused where possible. Four trees will be removed on site as a part of this development. Four trees will be removed during construction. All other trees will be protected to remain (see Attachment F for the full arborist report). The total new plus replaced impervious surfaces is 7,250 square feet. See TABLE 1 for a summary of land cover calculations and Figure 1 for lower portion of driveway that is bypassing the detention system. A summary of the onsite soils is included in the following sections. Since the project will add greater than 5,000 SF of new plus replaced impervious surfaces, it is subject to Minimum Requirements 1 through 9 (outlined in Section I-3.3, Figure 3.3.2 of the Manual).

TABLE 1 **Land Cover Summary**

	Project Site Areas			
	Existing		Developed	
	SF	Acres	SF	Acres
Impervious Areas:				
Ex House	3,275	0.075		
Ex Driveway	2405	0.055		
Ex Walkways	1030	0.024		
New SFR			4,525	0.104
New Driveway			1,625	0.037
Walkway and Patios			1,100	0.025
Total Onsite Impervious Surface:	**6,710**	**0.154**	**7,250**	**0.166**
Total New/Replaced Onsite Impervious Surface:			**7,250**	**0.166**
Total Onsite Pollution Generating Impervious Surface:	**2,405**	**0.055**	**1,625**	**0.037**
Total New/Replaced Onsite Pollution Generating Impervious Surface:			**1,625**	**0.037**
Total Onsite Pervious Surface:	**8,468**	**0.194**	**7,928**	**0.182**
Onsite Grass/Landscaping	8,468	0.194	5,572	0.128
Protected Undeveloped Area			2,356	0.054
Total Onsite Project Site Area	**15,178**	**0.348**	**15,178**	**0.348**

The areas in TABLE 1 were determined by area measurements in AutoCAD from a topographic survey. As shown in TABLE 1, the developed site total impervious surfaces are 7,250 SF, all of which are new and replaced impervious surfaces. The project also proposes 1,625 SF of new plus replaced pollution generating impervious surfaces.

2 DRAINAGE SYSTEM

The onsite stormwater system is comprised of a Type 1 catch basin, area drains, trench drain, two 60"Ø x 36.5' long detention pipes, two Type 2 catch basins, a stormwater pump station, a flow restrictor tee, 4" and 6" SDR35 PVC pipe, and a perforated PVC D2729 footing drain pipe. Stormwater runoff from the driveway area will be collected by a trench drain and routed to a pump station to be conveyed to a catch basin associated with the detention system. The stormwater pump station was sized to pump the 100-year flow from the tributary area, according to WWHM2012. See Attachment H for the WWHM report and associated pump sizing calculations. Runoff from the proposed single-family residence will be captured in a gutter and downspout system and conveyed to the Type 2 catch basin associated with the detention facility. Any stormwater collected within the building footing drains will be routed to a 12" area drain which contains a 2' min sump for the settlement of fines. The outlet from this area drain connects to the onsite storm pipes which are routed to the detention facility. See the Drainage Plan in Attachment A for additional details on the proposed drainage system.

All collected stormwater on site will be routed to the detention system before being conveyed to the public storm main in SE 65th St. The detention facility was sized using Table 1 of the City of Mercer Island's Onsite Detention Design Requirements document, which can be seen in Attachment E, since the project is proposing less than 9,500 SF of new plus replaced impervious surface. The total new plus replaced impervious surfaces are 7,250 SF which falls within the 7,000 to 8,000 SF new and replaced

impervious surface area range in the detention sizing table. The detention facility will have a pipe diameter of 60" and a total pipe length of 73 ft since the soils on site are classified as Type B soils (see Section 5 and Attachment B for additional soils information). The orifice elevations and dimensions were also determined from Table 1 of the City of Mercer Island's Onsite Detention Design Requirements document which is included in Attachment E.

3 LEVEL 1 DOWNSTREAM ANALYSIS

Per the Manual, development projects that discharge stormwater offsite shall submit an offsite analysis that assesses the potential off-site water quality, erosion, slope stability, and drainage impacts associated with the project and the appropriate mitigation of those impacts up to 1/4 miles downstream of the site. The Level 1 downstream analysis was performed using the City of Mercer Island GIS Mapping and Google Maps. The drainage path starts with the storm main in 82nd Ave SE which flows south west across private property and crosses 81st Ave SE and continues west onto private property where it then transitions north where it enters an open water course. This marks the end of the ¼ mile downstream analysis, but flow continues west until it enters Lake Washington. See Exhibit D for Downstream Analysis Map.

4 MINIMUM REQUIREMENTS

Since the project will add greater than 5,000 SF of new plus replaced impervious surfaces, it is subject to Minimum Requirements #1 through 9 (MR#1-9) in the Manual. The Project meets MR#1-9 as follows:

4.1 MINIMUM REQUIREMENT #1 – STORMWATER SITE PLANS

The Stormwater Site Plan was prepared in accordance with Volume 3 Chapter 3 of the Manual and includes the minimum requirements applicable to the subject site based on thresholds of new and replaced site impervious coverage.

4.2 MINIMUM REQUIREMENT #2 – CONSTRUCTION STORMWATER POLLUTION PREVENTION

The Construction Stormwater Pollution Prevention Plan (SWPP) was prepared in accordance with Volume 2 Chapter 2 of the Manual and is described below in Section 6 of this report. The Temporary Erosion and Sediment Control Plan (TESC Plan) can be seen in in the Project Plans submitted under separate cover and serves as a guide for the contractor to implement a final TESC Plan. As the site disturbance is less than one acre, a Stormwater Permit is not required.

4.3 MINIMUM REQUIREMENT #3 – SOURCE CONTROL

The proposed catch basins, spill control elbows, detention facility, area drains with sumps, and cleanouts serve as source control of pollution on the project site. In order to control pollutants, proper maintenance and cleaning of debris, sediment, and oil from stormwater collection and conveyance systems is required per the operation and maintenance recommendations found in Appendix 5-A in Volume 5 of the Manual in addition to the BMPs in Volume 4. See Attachment D for operation and maintenance requirements pertaining to the project.

4.4 Minimum Requirement #4 – Preservation of Natural Drainage Systems and Outfalls

The proposed drainage system will emulate the natural pre-developed conditions of the site (i.e., forested conditions) as much as possible as a portion of the undisturbed natural vegetation on the site will remain undisturbed. Stormwater will be detained onsite and discharge from the site will connect to the public drainage system within 82nd Ave SE which eventually drains to Lake Washington, thus maintaining the natural drainage course from the site.

4.5 Minimum Requirement #5 – On-site Stormwater Management

The On-Site Stormwater Management requirements applicable to this project were determined using List #1. The project complies with List #1 as described below.

Lawn and landscaped areas:

All disturbed pervious surfaces will be amended in accordance with the Post-Construction Soil Quality and Depth requirements as listed under BMP T5.13 in Chapter 5 of Volume V.

Roof:

1. Full Dispersion is infeasible because the required vegetated flowpath is not available. Downspout Full Infiltration is infeasible because the site is mapped within the "Infiltrating LID facilities are not permitted" area according to Figure 3: Low Impact Development Infiltration Feasibility on Mercer Island Map, which is available online.
2. Bioretention or rain garden facilities are infeasible because the site is mapped within the "Infiltrating LID facilities are not permitted" area according to Figure 3: Low Impact Development Infiltration Feasibility on Mercer Island Map, which is available online.
3. Downspout Dispersion Systems is infeasible because the required vegetated flowpath is not available onsite.
4. Perforated Stub-out Connections is infeasible because the site is mapped within the "Infiltrating LID facilities are not permitted" area according to Figure 3: Low Impact Development Infiltration Feasibility on Mercer Island Map, which is available online.
5. On-site detention will be utilized for the stormwater management of all roof surfaces on site.

Other Hard Surfaces:

1. Full dispersion is infeasible because the required vegetated flowpath is not available onsite.
2. Permeable pavement, rain gardens, and bioretention are infeasible because the site is mapped within the "Infiltrating LID facilities are not permitted" area according to Figure 3: Low Impact Development Infiltration Feasibility on Mercer Island Map, which is available online.
3. Sheet flow dispersion and concentrated flow dispersion are infeasible because the required vegetated flowpath is not available onsite and may create issues with the neighboring house downgradient of the site.
4. On-site detention will be utilized for the stormwater management of all non-roof impervious surfaces on-site. A portion of the new driveway (950 SF) will remain unmitigated as stormwater cannot be collected off-site and conveyed to the detention facility via gravity.

Therefore, the Post-Construction Soil Quality and Depth requirements as listed under BMP T5.13 and the detention facility utilized for the impervious surfaces on site satisfies MR#5.

4.6 Minimum Requirement #6: Runoff Treatment

This project does not trigger Minimum Requirement #6 since less than 5,000 SF of pollution generating hard surface (PGHS) is proposed.

4.7 Minimum Requirement #7: Flow Control

The project does not trigger Minimum Requirement #7 because less than 10,000 SF of effective impervious surfaces is proposed, the project will not convert ¾ acres or more of vegetation to lawn or landscape, and the project will not cause a 0.15 cubic foot per second increase in the 100-year flow frequency from a threshold discharge area (the project site) as estimated using an approved hydrology model (WWHM2012) using 15-minute time steps. Using 15-minute time steps, the predeveloped 100-year flow frequency is 0.0085-cfs and the developed site 100-year flow frequency is 0.0565 cfs, resulting in a 0.048-cfs increase. See ATTACHEMENT H for the full WWHM2012 modeling report.

4.8 Minimum Requirement #8: Wetlands Protection

Per Section 3.4.8 of Volume I of the Manual, the thresholds for Minimum Requirements #6 and #7 apply to Minimum Requirement #8. Since this project does not trigger Minimum Requirement #6 and Minimum Requirement #7, it also does not trigger Minimum Requirement #8. Additionally, this project is not tributary to a wetland.

4.9 Minimum Requirement #9: Operation and Maintenance

An operation and maintenance manual consistent with Volume V of the Stormwater Manual has been provided in Attachment D.

5 Soils

A soils investigation was completed by Geotech Consultants Inc, on December 27, 2023. One test pit and several test holes were excavated to exploration depth of approximately 4.5 and 5 feet for the test holes and 10 feet for the test pit. Boring locations and details are summarized in the Geotechnical Report attached as Attachment B.

Subsurface exploration generally encountered a top layer of topsoil, native sand was revealed near the ground surface. Initially, the sand was loose but became medium-dense at depths of approximately 2 to 2.5 feet. The sand then became medium-dense to dense at approximately 3 to 4 feet and became dense with depth. The test pit was excavated to a maximum depth of 10 feet.

Additionally, the site is mapped within the “Infiltrating LID facilities are not permitted” area according to Figure 3: Low Impact Development Infiltration Feasibility on the City of Mercer Island’s online map.

6 CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN (SWPP)

The SWPP Plan was prepared in accordance with The Manual. An Erosion and Sediment Control Plan is required per The Manual. Erosion and sediment control (ESC) measures were designed for the project and shown on the TESC plan. Both the SWPP and TESC Plan serve as guides as the contractor is required to design a working TESC plan for the site. The TESC is submitted under separate cover.

Element 1: Preserve Vegetation/Mark Clearing Limits
BMPs used:

- BMP C233: Silt Fence

Silt fence will be placed around the low points of the perimeter of the site.
Element 2: Establish Construction Access
BMPs used:

- BMP C105: Stabilize Construction Entrance/Exit

The project site will have one construction access connecting to SE 65th St. The contractor shall install a temporary construction entrance made from quarry spalls. SE 65th St and 82nd Ave NE will be swept daily, or more frequently as needed, to remove sediment tracked from the project site.
Element 3: Control Flow Rates
BMPs used:

- BMP C235: Wattles

If necessary, the contractor will implement compost socks and/or straw wattles to control flow rates and disperse stormwater.
Element 4: Install Sediment Controls
BMPs used:

- BMP C233: Silt Fence
- BMP C235: Wattles

Silt fencing or straw wattles will be placed along the low points of the perimeter of the construction site to prevent sediment from escaping downstream of the site.
Element 5: Stabilize Soils
BMPs used:

- BMP C121: Mulching
- BMP C140: Dust Control

Mulch will be used by the contractor whenever soils will be left exposed for a significant amount of time or whenever a rainfall event is anticipated. During summer months water will be sprinkled on the site as needed to minimize the amount of dust coming off the site.
Element 6: Protect Slopes
BMPs used:

- BMP C121 Mulching

Mulch will be added to soils on significant slopes to provide temporary protection from erosion.
Element 7: Protect Drain Inlets
BMPs used:

- BMP C220: Storm Drain Inlet Protection

Temporary catch basin inlet protection on all existing catch basins adjacent to the site will be implemented to prevent sediment from entering the drainage system.
Element 8: Stabilize Channels and Outlets

N/A. There are no existing roadside ditches and channels which require stabilization

Element 9: Control Pollutants

BMPs used:

- BMP C153: Material Delivery, Storage and Containment
- BMP C154: Concrete Washout Area

A material delivery, storage and containment area shall be designated by the contractor and located away from traffic and near the construction entrance. An onsite concrete washout area for any concrete mixing shall be designated by the contractor as well.

Element 10: Control De-Watering

BMPs used:

- Water Bars

De-watering should not be an issue on this site as the groundwater table is not known to be near the surface. However, the contractor shall apply water bars during construction as needed.

Element 11: Maintain BMPs

BMPs used:

- BMP C150: Materials On Hand
- BMP C160: Certified Erosion and Sediment Control Lead

The contractor shall keep erosion prevention and sediment control materials onsite for regular maintenance and emergency situations. The contractor will be the person in charge of erosion and sediment control for this project.

Element 12: Manage the Project

BMPs used:

- BMP C150: Materials On Hand
- BMP C160: Certified Erosion and Sediment Control Lead
- BMP C162: Scheduling

The contractor will be in control of erosion and sediment control and will keep erosion prevention and sediment control materials onsite for regular maintenance and emergency situations. The construction project will be sequenced in an orderly manner to minimize the duration of exposed soil to erosion.

Element 13: Protect Low-Impact Development BMPs

BMPs used:

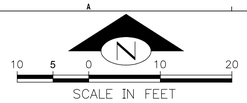
- BMP C102: Buffer Zone
- BMP C103: High Visibility Fence
- BMP C233: Silt Fence

N/A since to LID BMPs are infeasible on the site besides Post-Construction Soil Quality and Depth for landscaped areas. See Section 4.5 of this report for more information on the infeasibility of LID BMPs.

7 ATTACHMENTS

ATTACHMENT A – DRAINAGE PLAN
ATTACHMENT B – GEOTECHNICAL REPORT
ATTACHMENT C – DOWNSTREAM ANALYSIS
ATTACHMENT D – OPERATION AND MAINTENANCE MANUAL
ATTACHMENT E– DETENTION FACILITY SIZING EXHIBIT
ATTACHMENT F – ARBORIST REPORT
ATTACHMENT G – WWHM REPORT
ATTACHMENT H – WWHM & PUMP SIZING

ATTACHMENT A – DRAINAGE PLAN



KEY NOTES:

KEY	NOTE:	DETAIL /SHEET
1	EX TYPE 1 CATCH BASIN RIM 294.18 8" IE (E) 290.15 EX 12" IE (N) 290.08 EX 12" IE (S) 290.13	F/C08
2	SAWCUT AND MATCH EG. REPLACE EX ASPHALT PAVEMENT SECTION IN-KIND	-
3	31 LF 12" SD @ 2.00% MIN	-
4	TYPE 1 CATCH BASIN W/ SOLID LOCKING LID RIM 297.07± 12" IE (E) 293.40 12" IE (W) 293.40	F/C08
5	45 LF 12" SD @ 2.00% MIN	-
6	TYPE 1 CATCH BASIN W/ SOLID LOCKING LID. CB TO BE SHIFTED WEST AS NECESSARY TO BE LOCATED OUTSIDE OF DRIVEWAY APPROACH RIM 301.23± 6" IE (E) 298.00 12" IE (W) 298.00	F/C08
7	38 LF 6" SD @ 2.00% MIN (PRIVATE DRAINAGE SYSTEM OWNED BY 6520 82ND AVE SW)	-
8	TYPE 1 CATCH BASIN W/ SOLID LOCKING LID & OIL/WATER SEPARATOR RIM 305.00± 6" IE (NE) 302.50 6" IE (SW) 302.40	F/C08
9	14 LF TRENCH DRAIN RIM 304.56 6" IE 302.06	I/C08
10	3 LF 6" SD @ 2.00% MIN	-
11	DUPLEX STORM PUMP STATION W/ SOLID LOCKING LID RIM 305.57 6" IE (SW) 302.00 2" IE (NE) 302.00 (SDFM) SUMP PER MANUFACTURER'S RECOMMENDATIONS	J/C10
12	92 LF 2" SDFM	-
13	97 LF 6" SD @ 2.00% MIN	-
14	6" SDCO RIM 317.30 6" IE 314.80	E/C08
15	54"Ø TYPE 2 CATCH BASIN W/ FLOW CONTROL STRUCTURE RIM 317.50 36" IE (E) 309.90 2" IE (SW) 314.50 (INLET, SDFM) 6" IE (S) 313.90 (INLET) 6" IE (W) 309.90 (OUTLET) FLOW CONTROL STRUCTURE INFO: 6" OVERFLOW ELEV 314.40 ORIFICE #2: 2.0"Ø @ ELEV 313.90 ORIFICE #1: 0.70"Ø @ ELEV 307.90	G/C08, H/C09
16	5 LF 6" SD @ 2.00% MIN	-
17	6" SDCO RIM 317.50 6" IE 314.10	E/C08
18	2 LF 4" SD @ 2.00% MIN	-
19	12" AREA DRAIN RIM 317.50 4" IE (S) 315.00 (FTG DRN) 4" IE (N) 315.00 2' MIN SUMP	-
20	4" SOLID WALL PVC FOOTING DRAIN TIGHTLINE @ 2.00% MIN 4" IE 316.00	-
21	6 LF 6" SD @ 2.00% MIN	-
22	35 LF 6" SD @ 2.00% MIN	-
23	6" SDCO RIM 317.52± 6" IE 315.50	E/C08
24	NOT USED	-
25	60 LF 6" SD @ 2.00% MIN	-
26	12" AREA DRAIN RIM 319.00± 4" IE 317.00	-
27	12" AREA DRAIN RIM 319.00± 6" IE 317.00 2' MIN SUMP	-
28	2 LF 36" SD LAID FLAT @ ELEV 309.90	-
29	DETENTION FACILITY (2) 5'Ø X 36.5'L PIPE LAID FLAT TOP OF 60" PIPE 314.40 36" IE (N) 309.90 60" IE 309.40	H/C09
30	54"Ø TYPE 2 CATCH BASIN RIM 318.75 36" IE (W) 309.90 36" IE (S) 309.90	G/C08, H/C09
31	35 LF 6" SD @ 2.00% MIN	-
32	6" SDCO RIM 318.56 6" IE 314.80	E/C08
33	110 LF 6" SD @ 2.00% MIN	-
34	3 LF 4" SD @ 2.00% MIN	-
35	12" AREA DRAIN RIM 319.05 4" IE 317.05	-
36	PERIMETER FOOTING DRAIN - 4" PERFORATED PVC PIPE IN 6" MIN WASHED GRAVEL, WRAPPED IN NON-WOVEN GEOTEXTILE FILTER FABRIC (TYP.)	-
37	6" SDCO RIM 318.70 6" IE 317.00	E/C08
38	4" ROOF DS AND TIGHTLINE @ 2.00% MIN (TYP)	-
39	4" ROOF DS (TYP)	-
40	2 LF 4" SD @ 2.00% MIN	-
41	5 LF 6" SD @ 2.00% MIN	-
42	6" SDCO RIM 317.30 6" IE 309.80	E/C08
43	APPROX LOCATION OF EX DRIVEWAY (NOT SURVEYED)	-
44	REPLACE DISTURBED ASPHALT DRIVEWAY AND BRICK WALKWAYS IN-KIND	-

FOOTING DRAINS:
1. FOOTING DRAINS SHALL BE INSTALLED AROUND ALL FOUNDATIONS WHICH ENCLOSE A CRAWL SPACE, CELLAR, BASEMENT, GARAGE OR OTHER BUILDING SPACE.
2. DRAINS SHALL BE CONSTRUCTED OF PERFORATED PIPE INSTALLED AT THE BASE OF THE FOOTING.
3. DRAIN PIPE SHALL MEET MATERIAL STANDARDS FOR D2729 FOR P.V.C. PIPE, WITH THE PERFORATIONS DIRECTED DOWNWARD.
4. GRANULAR BACKFILL SHALL BE PLACED AROUND AND ABOVE THE FOOTING DRAIN TO A DEPTH OF 2/3 OF THE HEIGHT OF THE WALL.
5. A FILTER FABRIC SHALL BE USED TO PREVENT SOIL PARTICLES FROM ENTERING THE FOOTING DRAIN. IT IS PREFERABLE THAT THE FABRIC BE PLACED BETWEEN THE GRANULAR BACKFILL AND THE NATIVE SOILS.

DRIVEWAY/PARKING AREA DRAINS:
1. LARGE IMPERVIOUS AREAS USED FOR PARKING OR MANEUVERING OF VEHICLES SHALL BE SLOPED TO DRAIN TO ONE OR MORE CATCH BASINS.
2. THE BASINS SHALL BE TIED INTO THE ON-SITE STORM DRAINAGE SYSTEM USING NON-PERFORATED PIPE OF THE SAME MATERIALS.
3. AT LEAST ONE CATCH BASIN SHALL HAVE AN OIL SEPARATOR TO CLEAN THE WATER, OIL AND SILT PRIOR TO ENTERING THE APPROVED STORM SYSTEM.
4. IN AREAS WHERE THE OFF-SITE STORM SYSTEM IS INADEQUATE, ON-SITE DETENTION OF RUNOFF MAY BE REQUIRED. (CONTACT THE DEVELOPMENT ENGINEER FOR MORE INFORMATION).

GENERAL:
1. SLOPE ALL DRAIN LINES AT 2% MINIMUM TOWARD THE OUTLET.
2. PROVIDE CLEANOUTS OR CONTROL STRUCTURES AS APPROPRIATE.
3. ALL DRAINAGE PIPING AND STRUCTURES ARE SUBJECT TO INSPECTION PRIOR TO BACKFILLING.
4. ROOF AND FOOTING DRAINS MAY BE COMBINED BEYOND THE LOWEST POINT OF THE FOOTING DRAIN.
5. USE SAND COLLARS AT CB CONNECTIONS TO P.V.C. PIPE.

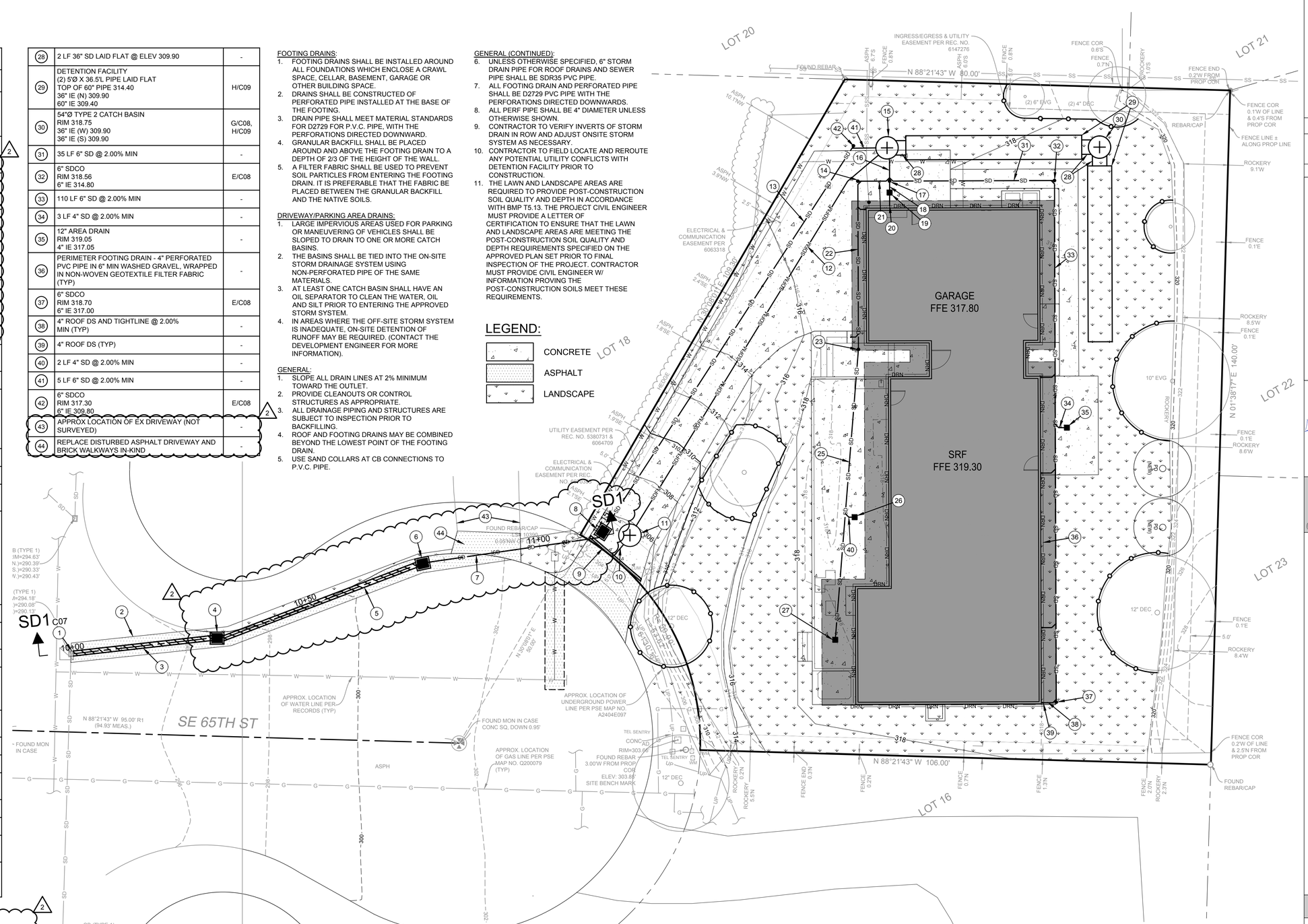
GENERAL (CONTINUED):
6. UNLESS OTHERWISE SPECIFIED, 6" STORM DRAIN PIPE FOR ROOF DRAINS AND SEWER PIPE SHALL BE SDR35 PVC PIPE.
7. ALL FOOTING DRAIN AND PERFORATED PIPE SHALL BE D2729 PVC PIPE WITH THE PERFORATIONS DIRECTED DOWNWARDS.
8. ALL PERF PIPE SHALL BE 4" DIAMETER UNLESS OTHERWISE SHOWN.
9. CONTRACTOR TO VERIFY INVERTS OF STORM DRAIN IN ROW AND ADJUST ONSITE STORM SYSTEM AS NECESSARY.
10. CONTRACTOR TO FIELD LOCATE AND REROUTE ANY POTENTIAL UTILITY CONFLICTS WITH DETENTION FACILITY PRIOR TO CONSTRUCTION.
11. THE LAWN AND LANDSCAPE AREAS ARE REQUIRED TO PROVIDE POST-CONSTRUCTION SOIL QUALITY AND DEPTH IN ACCORDANCE WITH BMP T5.13. THE PROJECT CIVIL ENGINEER MUST PROVIDE A LETTER OF CERTIFICATION TO ENSURE THAT THE LAWN AND LANDSCAPE AREAS ARE MEETING THE POST-CONSTRUCTION SOIL QUALITY AND DEPTH REQUIREMENTS SPECIFIED ON THE APPROVED PLAN SET PRIOR TO FINAL INSPECTION OF THE PROJECT. CONTRACTOR MUST PROVIDE CIVIL ENGINEER W/ INFORMATION PROVING THE POST-CONSTRUCTION SOILS MEET THESE REQUIREMENTS.

LEGEND:

CONCRETE

ASPHALT

LANDSCAPE



GENERAL NOTES:

1. AS-BUILTS MUST BE TIED TO THE CITY'S HORIZONTAL DATUM.
2. PUMP SYSTEMS SHALL BE OWNED, OPERATED, MAINTAINED, REPAIRED, AND REPLACED (AS NEEDED) BY PROPERTY OWNER(S) SERVED BY SUCH SYSTEM. THE PUMP SYSTEM SHALL HAVE DUAL, ALTERNATING PUMPS WITH EMERGENCY ON-SITE, BACK-UP POWER SUPPLY AND AN EXTERNAL ALARM SYSTEM FOR SYSTEM FAILURES. IT IS THE SOLE RESPONSIBILITY OF THE HOME OWNER IF THE FLOOD OR SEWER BACKUP OCCURS DUE TO THE FAILURE OF THE PUMP SYSTEM. IT IS THE RESPONSIBILITY OF THE HOME OWNER TO PROVIDE AN ADEQUATE AND FUNCTIONAL BACKUP SYSTEM FOR THE PUMP SYSTEM IN THE EVENT OF THE POWER FAILURE.

CALL 811
2 BUSINESS DAYS
BEFORE YOU DIG
(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

DRAINAGE NOTES:

ROOF DRAINS:
1. NUMBER AND SIZE SHALL BE IN CONFORMANCE WITH THE UNIFORM PLUMBING CODE.
2. DOWNSPOUTS SHALL BE TIED INTO A NON-PERFORATED, RIGID, SMOOTH-BORE PIPE, WHICH DRAINS TO AN APPROVED STORM SYSTEM.
3. DRAINPIPE SHALL MEET MATERIAL STANDARDS FOR D2729 FOR P.V.C. PIPE, GR F-405 FOR SMOOTH-BORE H.D.P.E. PIPE.
4. PROVIDE CLEANOUTS AT THE UPPER END OF THE SYSTEM AND AT EACH CUMULATIVE CHANGE OF DIRECTION IN EXCESS OF 135 DEGREES.
5. ALL PIPE FITTINGS SHALL BE MADE OF THE SAME MATERIAL AS THE STRAIGHT PIPE. GLUED JOINTS SHALL USE A BONDING AGENT RECOMMENDED BY THE PIPE MANUFACTURER.

DRAINAGE PLAN
SCALE: 1" = 10'

NO.	DATE	BY	REVISION
1	06/19/2024	LG	CITY REVIEW CORRECTIONS #1
2	07/19/2024	LG	CITY REVIEW CORRECTIONS #2

BASE MAP/TOPOGRAPHY PROVIDED BY OTHERS. FACET CANNOT BE HELD LIABLE FOR ACCURACY. CONTRACTOR SHALL FIELD VERIFY GRADES, UTILITIES, AND ALL OTHER EXISTING FEATURES AND CONDITIONS. IF CONDITIONS ARE NOT AS SHOWN AND/OR PLANS CANNOT BE CONSTRUCTED AS SHOWN, CONTACT FACET PRIOR TO CONSTRUCTION.

FACET
P: 206.522.0024
www.facetnw.com
9706 4th Ave NE
Suite 300
Seattle, WA 98115
FEDERAL WAY | KIRKLAND | MOUNT VERNON | SEATTLE | SPOKANE | WHIDBEY ISLAND

BENJAMIN J. IDDINGS
STATE OF WASHINGTON
84901
REGISTERED
PROFESSIONAL ENGINEER
Digitally signed by Ben Iddings
Date: 2024.07.19 15:57:42 -07'00'

CALL 811
2 BUSINESS DAYS
BEFORE YOU DIG
(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

TEKIELA RESIDENCE
6520 82ND AVE SE
MERCER ISLAND, WA 98040
2311.0333.00

SCHEMATIC PLAN

DRAINAGE PLAN

DATE: 7/19/2024

PLAN NUMBER:
C05

SHEET 6 OF 10

FILE LOCATION: P:\CLIENTS-CIVIL\MCCLELLAN ARCHITECTS\6520 82ND AVE SE MERCER ISLAND\DWGS\DRAWINGS\6520 82ND AVE SE_MERCER ISLAND.DWG - ORIGINAL SHEET SIZE: ARCH FULL BLEED D (36.00 X 24.00 INCHES) - LAST MODIFIED BY: GERDA SZOBOSZLAI
PRINCIPAL: BI PROJECT MANAGER: BI DESIGNED BY: LG DRAWN BY: CK, GS CHECKED BY: BI

ATTACHMENT B – GEOTECHNICAL REPORT

GEOTECH
CONSULTANTS, INC.

2401 10th Ave E
Seattle, Washington 98102
(425) 747-5618

December 27, 2023

JN 23413

Izabela Tekiela
5026 – 84th Avenue Southeast
Mercer Island, Washington 98040
via email: izabelatekiela@gmail.com

Subject: **Transmittal Letter – Geotechnical Engineering Study**
Proposed Residential Project
6520 – 82nd Avenue Southeast
Mercer Island, Washington

Greetings:

Attached to this transmittal letter is our geotechnical engineering report for the residential project to be constructed on Mercer Island, Washington. The scope of our services consisted of exploring site surface and subsurface conditions, and then developing this report to provide recommendations for general earthwork and geotechnical engineering design considerations for the project. This work was authorized by your acceptance of our proposal, P-11518, dated November 20, 2023.

The attached report contains a discussion of the study and our recommendations. Please contact us if there are any questions regarding this report, or for further assistance during the design and construction phases of this project.

Respectfully submitted,

GEOTECH CONSULTANTS, INC.

D. Robert Ward, P.E.
Principal

cc: **McClellan Architects** – Joey Pasquinelli
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DRW:kg

GEOTECHNICAL ENGINEERING STUDY
Residential Project
6520 – 82nd Aveue Southeast
Mercer Island, Washington

This report presents the findings and recommendations of our geotechnical engineering study for the site of the proposed residential project to be located at 6520 – 82nd Avenue Southeast on Mercer Island.

We were provided with a site plan and main floor plan of the project prepared by McClellan Architects. We also were provided site plans and a topographic map. A one-story residence and attached garage are located in the flat, central portion of the site. We understand that the garage portion will be removed completely, while the foundation of the residence will likely not be removed. A new one-story residence will be located in the same location as the existing residence, but a new detached garage is proposed further north of the existing garage. In addition, some significant patios are proposed on the western/southwestern sides of the residence. The patios may be raised as much as 3 feet above the existing ground.

If the scope of the project changes from what we have described above, we should be provided with revised plans in order to determine if modifications to the recommendations and conclusions of this report are warranted.

SITE CONDITIONS

SURFACE

The Vicinity Map, Plate 1, illustrates the general location of the southeastern portion of Mercer Island. The site has an irregular, but somewhat rectangular shape, being longest in the north-south direction. It is located east/northeast of the northeast portion of a cul-de-sac driveway that extends east of 82nd Avenue Southeast. The site is located in a residential neighborhood and is essentially surrounded by other residential properties.

The overall property slopes down to the west, similar to the surrounding neighborhood. However, the central, majority of the property is nearly flat; the existing one-story residence is located in this flat area. A sloped driveway extends up from the cul-de-sac northeasterly near the western property line that ends in the flat central portion adjacent to the residence; the grade change over this driveway is about 12 vertical feet. Some steep slopes/rockeries mostly line the eastern and western edges of the driveway. The steep slope/rockeries are up to about 8 feet tall at the driveway's northwestern portion and up to about 9 feet at the southeastern portion. In addition to the steep slope/rockery at the southeastern portion of the driveway, there is another small landscape rockery just above it that extends up to the nearly flat central portion of the property. The overall grade change between the flat portion of the property and the base of the driveway slope/rockery is up to approximately 13 feet. We did not observe any instability of these slopes/rockeries during our recent site visits. In addition to the slopes/rockeries on the western portion of the property, there is also an approximate 2- to 4-foot-tall rockery near the eastern property line. It appears there are relatively flat yard/landscape areas of neighboring properties at the top of the rockery. No seeps or springs were observed at the slopes/rockeries, nor anywhere on the site.

The existing residence is a one-story structure that has an attached garage on its northern end. The garage has a slab-on-grade floor, while the living portion of the residence has a crawl space above its main floor. The level of the main floor is one to two feet above the grade around the residence. Using a steel rod, we probed numerous areas around the perimeter of existing residence. Based on these probings, it appears that the residence is supported on a conventional footing foundation. The the top of the footing was found to vary from approximately 18 to 30 inches below the existing ground surface. In addition, the outside “lip” of the footing (outside of the foundation wall) varied from approximately 4 to 9 inches, The location of the probings and other information is shown on Plate 2 as discussed further in the subsequent section of this report.

Based on Mercer Island’s GIS portal, there are two designated Geologic Hazard Areas at the site, both located at/near the slopes/rockeries on the eastern and western portions of the site. The nearly flat central portion of the site is not a Hazard Area.

SUBSURFACE

The subsurface conditions were explored by excavating one test pit and several test holes at the approximate locations shown on the Site Exploration Plan, Plate 2. We also used a steel rod to probe conditions/soils in some areas adjacent to the residence foundation (the depth to the top of existing footings and the approximate width of footings using the probe is described in the previous section of this report); the probing locations are also shown on Plate 2. Our exploration program was based on the proposed construction, anticipated subsurface conditions and those encountered during exploration, and the scope of work outlined in our proposal.

The test pit was excavated on December 15, 2023 with a small tracked excavator. A geotechnical engineer from our staff observed the excavation process, logged the test pits, and obtained representative samples of the soil encountered. "Grab" samples of selected subsurface soil were collected from the backhoe bucket. The Test Pit Log is attached to this report as Plate 3. The test holes were hand-excavated by the geotechnical engineer, and their logs are attached as Plate 4.

Soil Conditions

Native soils were revealed in the test pit, test hole, and probings. Generally below a top layer of topsoil, native sand was revealed near the ground surface. Initially, the sand was loose but became medium-dense at depths of approximately 2 to 2.5 feet. The sand then became medium-dense to dense at approximately 3 to 4 feet and became dense with depth. The test pit was excavated to a maximum depth of 10 feet.

No obstructions were revealed by our explorations. However, debris, buried utilities, and old foundation and slab elements are commonly encountered on sites that have had previous development.

Groundwater Conditions

No groundwater seepage was observed in the explorations, nor emanating from the ground at the property. We do not believe that groundwater will be a consideration for this project.

The stratification lines on the logs represent the approximate boundaries between soil types at the exploration locations. The actual transition between soil types may be gradual, and subsurface conditions can vary between exploration locations. The logs provide specific subsurface information

only at the locations tested. The relative densities and moisture descriptions indicated on the test pit/hole logs are interpretive descriptions based on the conditions observed during excavation.

The compaction of test pit backfill was not in the scope of our services. The test pits were backfilled with excavated soil that was lightly tamped into place. Loose soil will therefore be found in the area of the test pits. If this presents a problem, the backfill will need to be removed and replaced with structural fill during construction.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

THIS SECTION CONTAINS A SUMMARY OF OUR STUDY AND FINDINGS FOR THE PURPOSES OF A GENERAL OVERVIEW ONLY. MORE SPECIFIC RECOMMENDATIONS AND CONCLUSIONS ARE CONTAINED IN THE REMAINDER OF THIS REPORT. ANY PARTY RELYING ON THIS REPORT SHOULD READ THE ENTIRE DOCUMENT.

Based on the explorations done in the existing and proposed residence areas of the site, it appears that native, medium-dense sand soil exists at approximately 2 to 2.5 feet below the ground, and the sand becomes medium-dense to dense at approximately 3 to 4 feet. From our several probings around the perimeter of the existing residence, it appears that the top of the footing of the residence varies from approximately 18 to 30 inches below the existing ground surface. Based on this information, and assuming the footings are 6 inches deep (thus 24 to 36 inches below the ground surface), it appears that the existing footings bear on or very near the medium-dense sand soil. The footings, which generally appear to be about 14 inches wide based on the probings and an assumption that the existing foundation wall is 6 inches wide, can be reused if desired provided a relatively low bearing capacity (provided in the ***Conventional Footing Foundation*** section of this report) is used in the structural design of these existing footings. New footings are also suitable for new structures of the project, although they should bear on the slightly deeper, medium-dense to dense sand. New footings can be designed for a higher bearing capacity, also as noted in the ***Conventional Footing Foundation*** section of this report.

As noted earlier, based on Mercer Island's GIS portal, there are two designated Geologic Hazard Areas at property; these are located at/near the slopes/rockeries on the eastern and western portions of the site. The nearly flat central portion of the site is not a Hazard Area. A Critical Areas discussion of these areas is given in the subsequent section of this report.

The drainage and/or waterproofing recommendations presented in this report are intended only to prevent active seepage from flowing through concrete walls or slabs. Even in the absence of active seepage into and beneath structures, water vapor can migrate through walls, slabs, and floors from the surrounding soil, and can even be transmitted from slabs and foundation walls due to the concrete curing process. Water vapor also results from occupant uses, such as cooking, cleaning, and bathing. Excessive water vapor trapped within structures can result in a variety of undesirable conditions, including, but not limited to, moisture problems with flooring systems, excessively moist air within occupied areas, and the growth of molds, fungi, and other biological organisms that may be harmful to the health of the occupants. The designer or architect must consider the potential vapor sources and likely occupant uses, and provide sufficient ventilation, either passive or mechanical, to prevent a build up of excessive water vapor within the planned structure.

Geotech Consultants, Inc. should be allowed to review the final development plans to verify that the recommendations presented in this report are adequately addressed in the design. Such a plan review would be additional work beyond the current scope of work for this study, and it may include revisions to our recommendations to accommodate site, development, and geotechnical constraints that become more evident during the review process.

We recommend including this report, in its entirety, in the project contract documents. This report should also be provided to any future property owners so they will be aware of our findings and recommendations.

CRITICAL AREAS STUDY (MICC 19.07)

As noted in the ***General*** section above, there are two mapped Geologic Hazard Areas at the site. A discussion of each Area is given below:

Potential Landslide Hazard Area:

Under 19.16.010 of the Mercer Island City Code, a Landslide Hazard is defined as:

Those areas subject to landslides based on a combination of geologic, topographic, and hydrologic factors, including:

1. *Areas of historic failures;*

2. *Areas with all three of the following characteristics:*
   a. *Slopes steeper than 15 percent; and*
   b. *Hillsides intersecting geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock; and*
   c. *Springs or ground water seepage;*

3. *Areas that have shown evidence of past movement or that are underlain or covered by mass wastage debris from past movements;*

4. *Areas potentially unstable because of rapid stream incision and stream bank erosion; or*

5. *Steep slope. Any slope of 40 percent or greater calculated by measuring the vertical rise over any 30-foot horizontal run.*

Of the above criteria, the only one that applies to the site is 5.; this is at the slope/rockery on the southwestern side of the site. None of the other criteria apply to the site; there is no evidence of historic or past landslide movements, no springs or groundwater seepage, and no rapid stream incision or stream bank erosion.

With regard to the steep slope/rockeries area at the southwestern corner of the property (5.), we strongly believe that the lower rockery was placed in an excavated location and is adjacent to the native, medium-dense and denser sand soil. The small upper rockery is likely supporting fill soil. The residence is founded on the medium-dense sand (no fill) that is at least 2 feet below the ground, and all new building loads (including the proposed patio) will be founded on medium-dense to dense soil as recommended in this report, thus the foundations do/will bear on competent sand soil below the base of the small rockery; thus the small rockery does not provide any stability for the residence and patio structures, and these structures will have no effect on the

stability of the small rockery. The residence is set back about 25 feet from the top of the 9-foot-tall base rockery that is adjacent to competent sand soil, while the patio will be set back about 15 feet. As noted earlier, this rockery appears to be in a stable condition and supports competent sand. The only significant potential of instability would potentially be during an MCE seismic event. However, based on the setback distances, it is our professional opinion that this potential rockery failure would not affect stability of the existing and new structures on the property. Therefore, it is our opinion that no buffers or setbacks are required for the project other than what is currently proposed, provided the recommendations presented in this report are followed. In addition, no adverse conditions will be made on the property or on adjacent properties if the recommendations in this report are followed.

Erosion Hazard: The site also meets the City of Mercer Island's criteria for an Erosion Hazard Area. However, the work areas for the proposed work are located where only flat to gently sloped areas and excavations for the project will not be substantial. Thus, typical erosion control measures will be very suitable to suitably control the potential of erosion. One of the most important considerations, particularly during wet weather, is to immediately cover any bare soil areas to prevent accumulated water or runoff from the work area from becoming silty in the first place. A wire-backed silt fence should be erected on the downslope, western side of the property, and the existing vegetation should be left in-place where possible. Straw wattles may also be used in tandem with the silt fence as needed. Also, any soil stockpiles should be covered with plastic during wet weather. Soil stockpiles should be minimized. Following rough grading, it may be necessary to mulch or hydroseed bare areas that will not be immediately covered with landscaping or an impervious surface. The existing driveway can be used as a construction entrance, but any loose soil that reaches the driveway needs to be cleared ASAP.

Statement of Risk: In order to satisfy the City of Mercer Island's requirements, a statement of risk is needed. As such, we make the following statement:

It is our professional opinion that the recommendations presented in this report for the proposed project will render the development as safe as if it were not located in a Geologically Hazardous Area and will not adversely impact adjacent properties.

SEISMIC CONSIDERATIONS

In accordance with the International Building Code (IBC), the site class within 100 feet of the ground surface is best represented by Site Class Type D (Stiff Soil). As noted in the USGS website, the mapped spectral acceleration value for a 0.2 second (S_s) and 1.0 second period (S_1) equals 1.46g and 0.51g, respectively.

The IBC and ASCE 7 require that the potential for liquefaction (soil strength loss) during an earthquake be evaluated for the peak ground acceleration of the Maximum Considered Earthquake (MCE), which has a probability of occurring once in 2,475 years (2 percent probability of occurring in a 50-year period). The MCE peak ground acceleration adjusted for site class effects (F_{PGA}) equals 0.69g. The soils beneath the site are not susceptible to seismic liquefaction under the ground motions of the MCE because of their dense nature and/or the absence of near-surface groundwater.

Sections 1803.5 of the IBC and 11.8 of ASCE 7 require that other seismic-related geotechnical design parameters (seismic surcharge for retaining wall design and slope stability) include the potential effects of the Design Earthquake. The peak ground acceleration for the Design

Earthquake is defined in Section 11.2 of ASCE 7 as two-thirds (2/3) of the MCE peak ground acceleration, or 0.46g.

CONVENTIONAL FOOTING FOUNDATIONS

As noted earlier in this report, the existing footings can be used to support loads of the proposed residence project. However, a low bearing capacity of 2,000 psf should be used in the design of these footings. Where new footings are needed, they should bear on undisturbed, medium-dense to dens, native sand. An allowable bearing pressure of 3,000 pounds per square foot (psf) is appropriate for the new footings. A one-third increase in this design bearing pressure may be used when considering short-term wind or seismic loads. We recommend that continuous and individual spread footings have minimum widths of 16 and 24 inches, respectively. Exterior footings should also be bottomed at least 18 inches below the lowest adjacent finish ground surface for protection against frost and erosion. The local building codes should be reviewed to determine if different footing widths or embedment depths are required.

Lateral loads due to wind or seismic forces may be resisted by friction between the foundation and the bearing soil, or by passive earth pressure acting on the vertical, embedded portions of the foundation. For the latter condition, the foundation must be either poured directly against relatively level, undisturbed soil or be surrounded by level, well-compacted fill. We recommend using the following ultimate values for the foundation's resistance to lateral loading:

PARAMETER	ULTIMATE VALUE
Coefficient of Friction	0.50
Passive Earth Pressure	300 pcf

Where: pcf is Pounds per Cubic Foot, and Passive Earth Pressure is computed using the Equivalent Fluid Density.

If the ground in front of a foundation is loose or sloping, the passive earth pressure given above will not be appropriate. The above ultimate values for passive earth pressure and coefficient of friction do not include a safety factor.

FOUNDATION AND RETAINING WALLS

Retaining walls backfilled on only one side should be designed to resist the lateral earth pressures imposed by the soil they retain. The following recommended parameters are for walls that restrain level backfill:

PARAMETER	VALUE
Lateral Earth Pressure *	35 pcf
Passive Earth Pressure	300 pcf
Coefficient of Friction	0.50
Soil Unit Weight	120 pcf

Where: pcf is Pounds per Cubic Foot, and Lateral and Passive Earth Pressures are computed using the Equivalent Fluid Pressures.

*** For a restrained wall that cannot deflect at least 0.002 times its height, a uniform lateral pressure equal to 10 psf times the height of the wall should be added to the above lateral equivalent fluid pressure. This applies only to walls with level backfill.**

The design values given above do not include the effects of any hydrostatic pressures behind the walls and assume that no surcharges, such as those caused by slopes, vehicles, or adjacent foundations will be exerted on the walls. If these conditions exist, those pressures should be added to the above lateral soil pressures. Heavy construction equipment should not be operated behind retaining and foundation walls within a distance equal to the height of a wall, unless the walls are designed for the additional lateral pressures resulting from the equipment.

The values given above are to be used to design only permanent foundation and retaining walls that are to be backfilled, such as conventional walls constructed of reinforced concrete or masonry. It is not appropriate to use the above earth pressures and soil unit weight to back-calculate soil strength parameters for design of other types of retaining walls, such as soldier pile, reinforced earth, modular or soil nail walls. We can assist with design of these types of walls, if desired.

The passive pressure given is appropriate only for a shear key poured directly against undisturbed native soil, or for the depth of level, compacted fill placed in front of a retaining or foundation wall.**))** The values for friction and passive resistance are ultimate values and do not include a safety factor. Restrained wall soil parameters should be utilized the wall and reinforcing design for a distance of 1.5 times the wall height from corners or bends in the walls, or from other points of restraint. This is intended to reduce the amount of cracking that can occur where a wall is restrained by a corner.

Wall Pressures Due to Seismic Forces

Per IBC Section 1803.5.12, a seismic surcharge load need only be considered in the design of walls over 6 feet in height. A seismic surcharge load would be imposed by adding a uniform lateral pressure to the above-recommended lateral pressure. The recommended seismic surcharge pressure for this project is 8**H** pounds per square foot (psf), where **H** is the design retention height of the wall. Using this increased pressure, the safety factor against sliding and overturning can be reduced to 1.2 for the seismic analysis.

Retaining Wall Backfill and Waterproofing

Backfill placed behind retaining or foundation walls should be coarse, free-draining structural fill containing no organics. This backfill should contain no more than 5 percent silt or clay particles and have no gravel greater than 4 inches in diameter. The percentage of particles passing the No. 4 sieve should be between 25 and 70 percent. If the native sand is used as backfill, drainage composite similar to Miradrain 6000 should be placed against the backfilled retaining walls. The drainage composites should be hydraulically connected to the foundation drain system. The later section entitled ***Drainage Considerations*** should also be reviewed for recommendations related to subsurface drainage behind foundation and retaining walls.

The purpose of these backfill requirements is to ensure that the design criteria for a retaining wall are not exceeded because of a build-up of hydrostatic pressure behind the wall. Also, subsurface drainage systems are not intended to handle large volumes of water from surface runoff. The top 12 to 18 inches of the backfill should consist of a compacted, relatively impermeable soil or topsoil, or the surface should be paved. The ground surface must also slope away from backfilled walls at one to 2 percent to reduce the potential for surface water to percolate into the backfill.

Water percolating through pervious surfaces (pavers, gravel, permeable pavement, etc.) must also be prevented from flowing toward walls or into the backfill zone. Foundation drainage and waterproofing systems are not intended to handle large volumes of infiltrated water. The compacted subgrade below pervious surfaces and any associated drainage layer should therefore be sloped away. Alternatively, a membrane and subsurface collection system could be provided below a pervious surface.

It is critical that the wall backfill be placed in lifts and be properly compacted, in order for the above-recommended design earth pressures to be appropriate. The recommended wall design criteria assume that the backfill will be well-compacted in lifts no thicker than 12 inches. The compaction of backfill near the walls should be accomplished with hand-operated equipment to prevent the walls from being overloaded by the higher soil forces that occur during compaction. The section entitled ***General Earthwork and Structural Fill*** contains additional recommendations regarding the placement and compaction of structural fill behind retaining and foundation walls.

The above recommendations are not intended to waterproof below-grade walls, or to prevent the formation of mold, mildew or fungi in interior spaces. Over time, the performance of subsurface drainage systems can degrade, subsurface groundwater flow patterns can change, and utilities can break or develop leaks. Therefore, waterproofing should be provided where future seepage through the walls is not acceptable. This typically includes limiting cold-joints and wall penetrations, and using bentonite panels or membranes on the outside of the walls. There are a variety of different waterproofing materials and systems, which should be installed by an experienced contractor familiar with the anticipated construction and subsurface conditions. Applying a thin coat of asphalt emulsion to the outside face of a wall is not considered waterproofing, and will only help to reduce moisture generated from water vapor or capillary action from seeping through the concrete. As with any project, adequate ventilation of basement and crawl space areas is important to prevent a buildup of water vapor that is commonly transmitted through concrete walls from the surrounding soil, even when seepage is not present. This is appropriate even when waterproofing is applied to the outside of foundation and retaining walls. We recommend

that you contact an experienced envelope consultant if detailed recommendations or specifications related to waterproofing design, or minimizing the potential for infestations of mold and mildew are desired.

The ***General***, ***Slabs-On-Grade***, and ***Drainage Considerations*** sections should be reviewed for additional recommendations related to the control of groundwater and excess water vapor for the anticipated construction.

SLABS-ON-GRADE

The building floors can be constructed as slabs-on-grade atop firm native sand or on structural fill. The subgrade soil must be in a firm, non-yielding condition at the time of slab construction or underslab fill placement. Any soft areas encountered should be excavated and replaced with select, imported structural fill.

Even where the exposed soils appear dry, water vapor will tend to naturally migrate upward through the soil to the newly constructed space above it. This can affect moisture-sensitive flooring, cause imperfections or damage to the slab, or simply allow excessive water vapor into the space above the slab. All interior slabs-on-grade should be underlain by a capillary break drainage layer consisting of a minimum 4-inch thickness of clean gravel or crushed rock that has a fines content (percent passing the No. 200 sieve) of less than 3 percent and a sand content (percent passing the No. 4 sieve) of no more than 10 percent. Pea gravel or crushed rock are typically used for this layer.

As noted by the American Concrete Institute (ACI) in the *Guides for Concrete Floor and Slab Structures*, proper moisture protection is desirable immediately below any on-grade slab that will be covered by tile, wood, carpet, impermeable floor coverings, or any moisture-sensitive equipment or products. ACI recommends a minimum 10-mil thickness vapor retarder for better durability and long term performance than is provided by 6-mil plastic sheeting that has historically been used. A vapor retarder is defined as a material with a permeance of less than 0.3 perms, as determined by ASTM E 96. It is possible that concrete admixtures may meet this specification, although the manufacturers of the admixtures should be consulted. Where vapor retarders are used under slabs, their edges should overlap by at least 6 inches and be sealed with adhesive tape. The sheeting should extend to the foundation walls for maximum vapor protection.

If no potential for vapor passage through the slab is desired, a vapor *barrier* should be used. A vapor barrier, as defined by ACI, is a product with a water transmission rate of 0.01 perms when tested in accordance with ASTM E 96. Reinforced membranes having sealed overlaps can meet this requirement.

We recommend that the contractor, the project materials engineer, and the owner discuss these issues and review recent ACI literature and ASTM E-1643 for installation guidelines and guidance on the use of the protection/blotter material.

The ***General***, ***Permanent Foundation and Retaining Walls***, and ***Drainage Considerations*** sections should be reviewed for additional recommendations related to the control of groundwater and excess water vapor for the anticipated construction.

EXCAVATIONS AND SLOPES

Temporary excavation slopes should not exceed the limits specified in local, state, and national government safety regulations. Also, temporary cuts should be planned to provide a minimum 2 to 3 feet of space for construction of foundations, walls, and drainage. Temporary cuts to a maximum overall depth of about 4 feet may be attempted vertically in unsaturated soil, if there are no indications of slope instability. However, vertical cuts should not be made near property boundaries, or existing utilities and structures. Based upon Washington Administrative Code (WAC) 296, Part N, the soil at the subject site would generally be classified as Type B. Therefore, temporary cut slopes greater than 4 feet in height should not be excavated at an inclination steeper than 1:1 (Horizontal:Vertical), extending continuously between the top and the bottom of a cut.

The above-recommended temporary slope inclination is based on the conditions exposed in our explorations, and on what has been successful at other sites with similar soil conditions. It is possible that variations in soil and groundwater conditions will require modifications to the inclination at which temporary slopes can stand. Temporary cuts are those that will remain unsupported for a relatively short duration to allow for the construction of foundations, retaining walls, or utilities. Temporary cut slopes should be protected with plastic sheeting during wet weather. It is also important that surface runoff be directed away from the top of temporary slope cuts. Cut slopes should also be backfilled or retained as soon as possible to reduce the potential for instability. Please note that sand can cave suddenly and without warning. Excavation, foundation, and utility contractors should be made especially aware of this potential danger. These recommendations may need to be modified if the area near the potential cuts has been disturbed in the past by utility installation, or if settlement-sensitive utilities are located nearby.

Water should not be allowed to flow uncontrolled over the top of any temporary or permanent slope. All permanently exposed slopes should be seeded with an appropriate species of vegetation to reduce erosion and improve the stability of the surficial layer of soil.

DRAINAGE CONSIDERATIONS

Footing drains are only needed where: (1) crawl spaces or basements will be below a structure; (2) a slab is below the outside grade; or, (3) the outside grade does not slope downward from a building. Drains should also be placed at the base of all earth-retaining walls. These drains should be surrounded by at least 6 inches of 1-inch-minus, washed rock that is encircled with non-woven, geotextile filter fabric (Mirafi 140N, Supac 4NP, or similar material). At its highest point, a perforated pipe invert should be at least 6 inches below the bottom of a slab floor or the level of a crawl space. The discharge pipe for subsurface drains should be sloped for flow to the outlet point. Roof and surface water drains must not discharge into the foundation drain system. For the best long-term performance, perforated PVC pipe is recommended for all subsurface drains. Clean-outs should be provided for potential future flushing or cleaning of footing drains.

As a minimum, a vapor retarder, as defined in the ***Slabs-On-Grade*** section, should be provided in any crawl space area to limit the transmission of water vapor from the underlying soils. Crawl space grades are sometimes left near the elevation of the bottom of the footings. As a result, an outlet drain is recommended for all crawl spaces to prevent an accumulation of any water that may bypass the footing drains. Providing a few inches of free draining gravel underneath the vapor retarder is also prudent to limit the potential for seepage to build up on top of the vapor retarder.

The excavation and site should be graded so that surface water is directed off the site and away from the tops of slopes. Water should not be allowed to stand in any area where foundations, slabs, or pavements are to be constructed. Final site grading in areas adjacent to the residence and garage should slope away at least one to 2 percent, except where the area is paved. Surface drains should be provided where necessary to prevent ponding of water behind foundation or retaining walls. A discussion of grading and drainage related to pervious surfaces near walls and structures is contained in the ***Foundation and Retaining Walls*** section.

GENERAL EARTHWORK AND STRUCTURAL FILL

All building and pavement areas should be stripped of surface vegetation, topsoil, organic soil, and other deleterious material. The stripped or removed materials should not be mixed with any materials to be used as structural fill, but they could be used in non-structural areas, such as landscape beds.

Structural fill is defined as any fill, including utility backfill, placed under, or close to, a building, or in other areas where the underlying soil needs to support loads. All structural fill should be placed in horizontal lifts with a moisture content at, or near, the optimum moisture content. The optimum moisture content is that moisture content that results in the greatest compacted dry density. The moisture content of fill is very important and must be closely controlled during the filling and compaction process.

The allowable thickness of the fill lift will depend on the material type selected, the compaction equipment used, and the number of passes made to compact the lift. The loose lift thickness should not exceed 12 inches, but should be thinner if small, hand-operated compactors are used. We recommend testing structural fill as it is placed. If the fill is not sufficiently compacted, it should be recompacted before another lift is placed. This eliminates the need to remove the fill to achieve the required compaction. The following table presents recommended levels of relative compaction for compacted fill:

LOCATION OF FILL PLACEMENT	MINIMUM RELATIVE COMPACTION
Beneath slabs or walkways	92%
Filled slopes and behind retaining walls	90%
Beneath pavements	95% for upper 12 inches of subgrade; 90% below that level

Where: Minimum Relative Compaction is the ratio, expressed in percentages, of the compacted dry density to the maximum dry density, as determined in accordance with ASTM Test Designation D 1557-91 (Modified Proctor).

LIMITATIONS

The conclusions and recommendations contained in this report are based on site conditions as they existed at the time of our exploration and assume that the soil and groundwater conditions encountered in the test pit are representative of subsurface conditions on the site. If the subsurface conditions encountered during construction are significantly different from those observed in our

explorations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. Unanticipated conditions are commonly encountered on construction sites and cannot be fully anticipated by merely taking samples in test pit. Subsurface conditions can also vary between exploration locations. Such unexpected conditions frequently require making additional expenditures to attain a properly constructed project. It is recommended that the owner consider providing a contingency fund to accommodate such potential extra costs and risks. This is a standard recommendation for all projects.

This report has been prepared for the exclusive use of Izabela Tekiela and her representatives for specific application to this project and site. Our conclusions and recommendations are professional opinions derived in accordance with our understanding of current local standards of practice, and within the scope of our services. No warranty is expressed or implied. The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design. Our services also do not include assessing or minimizing the potential for biological hazards, such as mold, bacteria, mildew and fungi in either the existing or proposed site development.

ADDITIONAL SERVICES

In addition to reviewing the final plans, Geotech Consultants, Inc. should be retained to provide geotechnical consultation, testing, and observation services during construction. This is to confirm that subsurface conditions are consistent with those indicated by our exploration, to evaluate whether earthwork and foundation construction activities comply with the general intent of the recommendations presented in this report, and to provide suggestions for design changes in the event subsurface conditions differ from those anticipated prior to the start of construction. However, our work would not include the supervision or direction of the actual work of the contractor and its employees or agents. Also, job and site safety, and dimensional measurements, will be the responsibility of the contractor.

During the construction phase, we will provide geotechnical observation and testing services when requested by you or your representatives. Please be aware that we can only document site work we actually observe. It is still the responsibility of your contractor or on-site construction team to verify that our recommendations are being followed, whether we are present at the site or not.

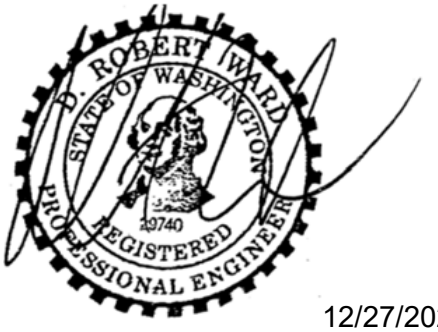
The following plates are attached to complete this report:

Plate 1	Vicinity Map
Plate 2	Site Exploration Plan
Plates 3 - 4	Test Pit and Test Hole Logs

We appreciate the opportunity to be of service on this project. Please contact us if you have any questions, or if we can be of further assistance.

Respectfully submitted,

GEOTECH CONSULTANTS, INC.

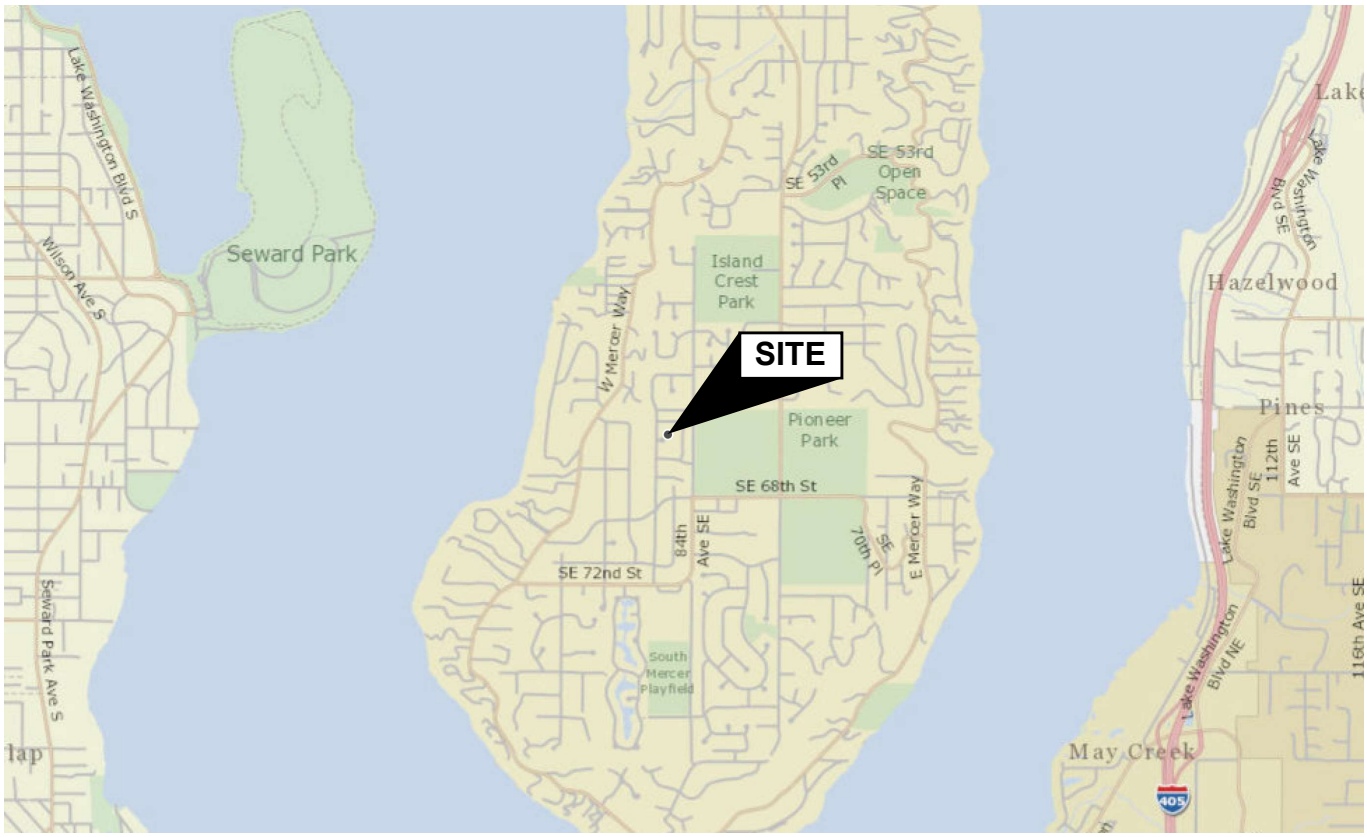


12/27/2023

D. Robert Ward, P.E.
Principal

DRW:kg

NORTH



(Source: King County iMap)

GEOTECH
CONSULTANTS, INC.

VICINITY MAP

6520 - 82nd Avenue Southeast
Mercer Island, Washington

Job No:	Date:		Plate:
23413	Dec. 2023		1

Legend:

- Test Pit Location
- Test Hole Location
- Probe Location

- XX Depth to Top of Footing
- XX Approx. Depth to Medium-Dense Soils
- XX Approx. Depth to Medium-Dense to Dense Soils
- XX Approx. Footing Width Outside of Foundation Wall

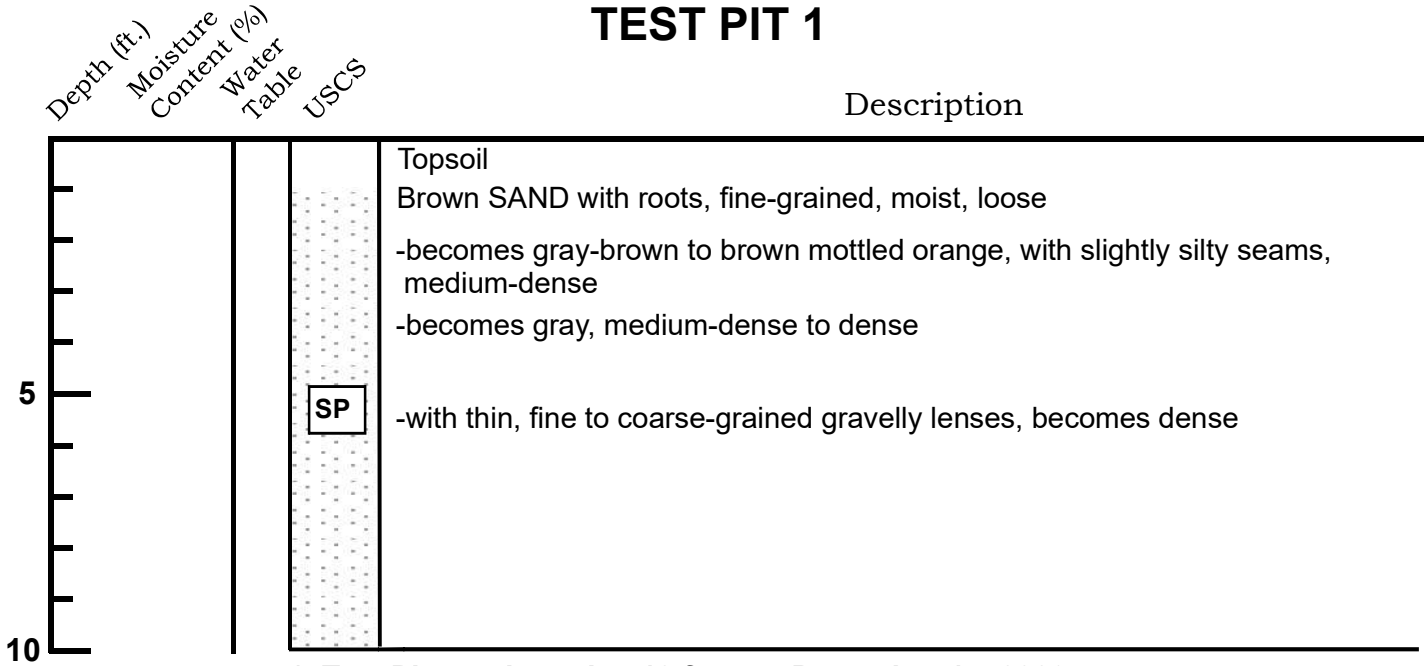
GEOTECH CONSULTANTS, INC.

SITE EXPLORATION PLAN

6520 - 82nd Avenue Southeast
Mercer Island, Washington

Job No:	Date:		Plate:
23413	Dec. 2023	No Scale	2

TEST PIT 1



* **Test Pit terminated at 10 feet on December 15, 2023.**
* **No groundwater seepage was observed during excavation.**
* **No caving observed during excavation.**

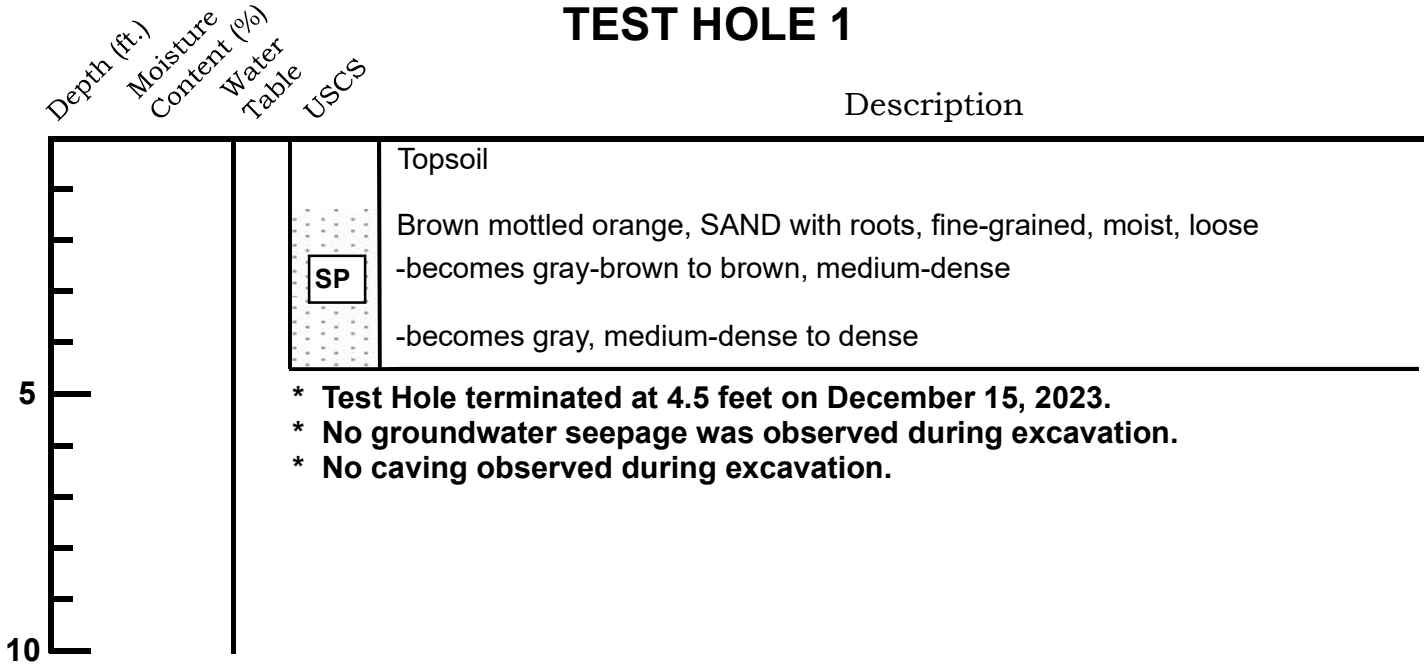
GEOTECH
CONSULTANTS, INC.

TEST PIT LOG

6520 - 82nd Avenue Southeast
Mercer Island, Washington

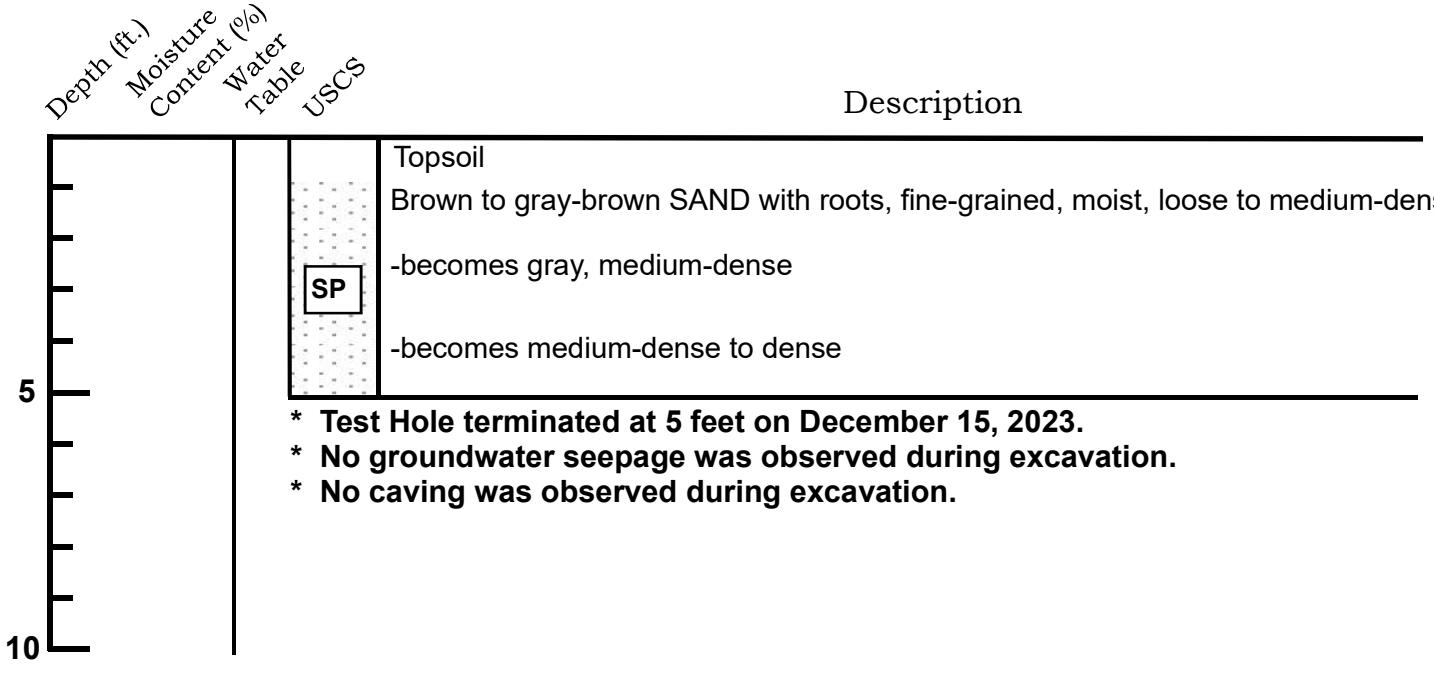
Job No:	Date:		Plate:
23413	Dec. 2023		3

TEST HOLE 1



*** Test Hole terminated at 4.5 feet on December 15, 2023.**
*** No groundwater seepage was observed during excavation.**
*** No caving observed during excavation.**

TEST HOLE 2



*** Test Hole terminated at 5 feet on December 15, 2023.**
*** No groundwater seepage was observed during excavation.**
*** No caving was observed during excavation.**

GEOTECH
CONSULTANTS, INC.

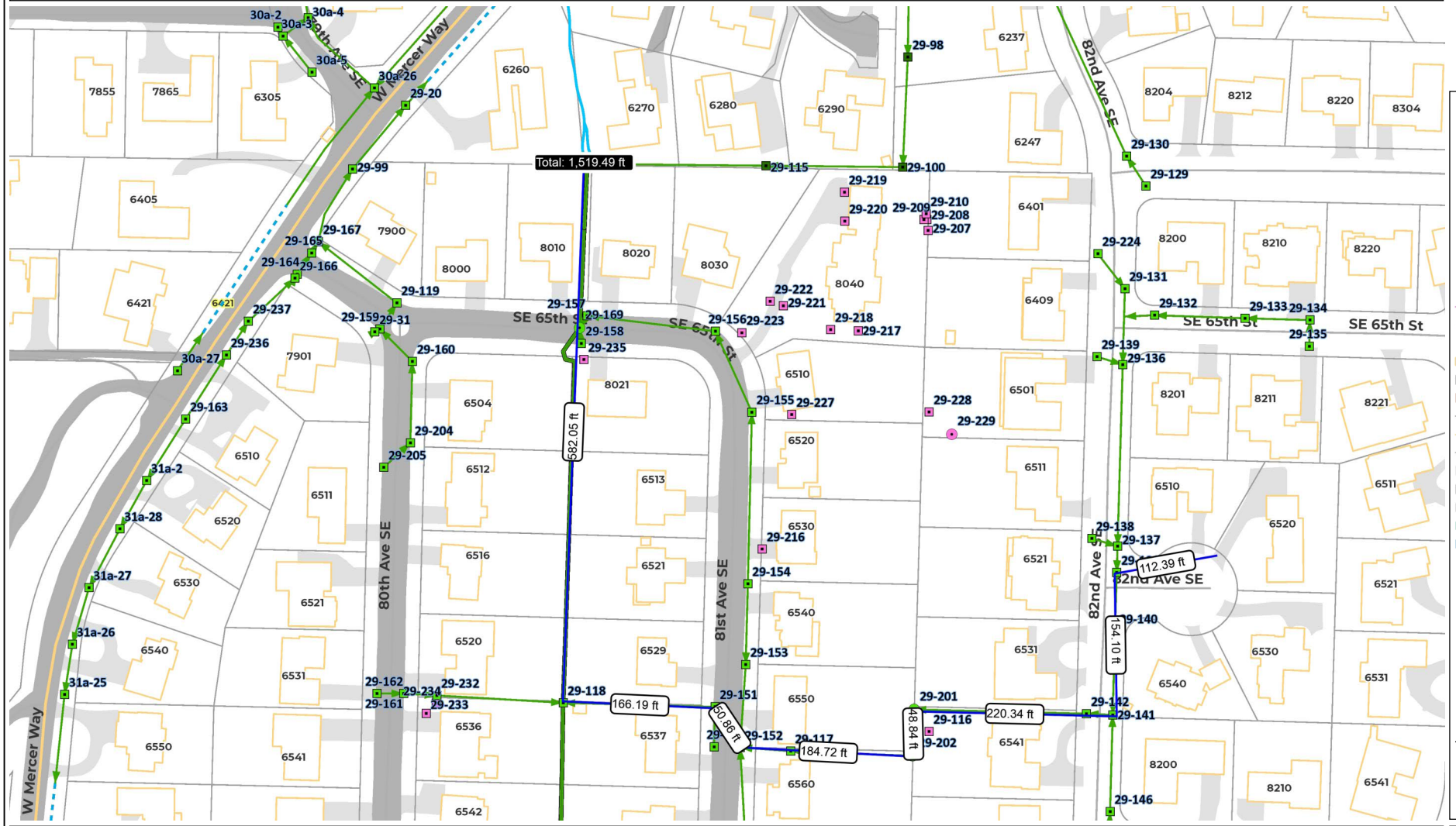
TEST HOLE LOGS

6520 - 82nd Avenue Southeast
Mercer Island, Washington

Job No:	Date:		Plate:
23413	Dec. 2023		4

ATTACHMENT C – DOWNSTREAM ANALYSIS MAP

City of Mercer Island



159.4 0 79.69 159.4 Feet

© City of Mercer Island Map Printed: January 17, 2024

Disclaimer: These maps were developed by the City of Mercer Island and are intended to be a general purpose digital reference tool. These maps are not an accepted legal instrument for describing, establishing, recording or maintaining descriptions for property concerns or boundaries. The City makes no representation or warranty with respect to the accuracy or currency of these data sets, especially in regard to labeling of surveyed dimensions, or agreement with official sources such as records of survey, or mapped locations of features.

Legend

- Storm Catch Basin
  - CB, City Owned
  - CB, Private
  - CB, Unknown
  - Type 2, City Owned
  - Type 2, Private
  - Type 2, Unknown
- Storm Main
  - Pipe
  - Open Watercourse
  - Piped Watercourse
  - Ditch
  - Culvert
  - Other
- Storm Main - Private
- Storm Discharge Poir
- Address
- Building
- Property Line
- Docks
- Freeway
- Major Street
- Street
- Paved Driveway
- Paved Road
- Paved Parking Area
- Parks
- Lake Washington

1: 1,250

Notes

ATTACHMENT D – OPERATION AND MAINTENANCE MANUAL

6520 82nd Ave SE
Operation and Maintenance Manual

Person or Organization Responsible for Maintenance of the On-Site Storm System:

Robert & Izabela Tekiela
6520 82nd Ave SE
Mercer Island, WA 98040

The Location Where the Operation and Maintenance Manual is to be Kept:

6520 82nd Ave SE
Mercer Island, WA 98040

*Note: The manual and maintenance activity log must be made available to the City of Mercer Island for inspection purposes.

Description of On-Site Storm System

The on-site storm system for 6520 82nd Ave SE consists of 4-36" conveyance pipe, 60" detention facilities, trench drain, stormwater pump station, 12" area drain, Type 1 catch basin and a Type 2 catch basins.

Stormwater runoff from the driveway will be collected by a trench drain and pumped to the Type 2 catch basin associated with the detention facilities. Likewise, runoff from the proposed single-family residence will be captured in a gutter and downspout system and conveyed to the Type 2 catch basin and then the detention facility. Any stormwater collected within the building footing drains will also be routed to an area drain which contains a 2' min sump for the settlement of fines and then routed to the Type 2 catch basin. All collected stormwater on site will be routed to the detention facility before being conveyed to the public storm main.

The Type I catch basin, (2) Type 2 catch basin, trench drain, stormwater pump station, (2) 36.5 LF 60" detention facility, 12" area drain, and storm drain cleanouts serve as source control of pollution for the project site. In order to control pollutants, proper maintenance and cleaning of debris, sediments, and oil from stormwater collection and conveyance systems is required per the operation and maintenance recommendations found in Volume 5 Section 4.6 of the Stormwater Manual in addition to the BMPs in Volume IV Section 2.2. See the attached sheets for operation and maintenance requirements pertaining to the project.

Contact Information for Stormwater Facility Manufacturers and Installers:

Contractor (Installer of On-Site Stormwater Facilities)
TBD

Civil Engineer (Designer of On-Site Stormwater Facilities)
Ben Iddins, P.E.
Davido Consulting Group, Inc
9706 4th Ave NE, Suite 300
Seattle, WA 98115
Phone – 206.523.0024 Ext. 115
ben@dcgengr.com

Attachments

- Maintenance Standards for Closed Detention Systems (2019 DOE Manual)
- Maintenance Standards for Control Structure/Flow Restrictor (2019 DOE Manual)
- Maintenance Standards for Catch Basins (2019 DOE Manual)

Table V-A.2: Maintenance Standards - Infiltration (continued)

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
		(A percolation test pit or test of facility indicates facility is only working at 90% of its designed capabilities. Test every 2 to 5 years. If two inches or more sediment is present, remove).	
Filter Bags (if applicable)	Filled with Sediment and Debris	Sediment and debris fill bag more than 1/2 full.	Filter bag is replaced or system is redesigned.
Rock Filters	Sediment and Debris	By visual inspection, little or no water flows through filter during heavy rain storms.	Gravel in rock filter is replaced.
Side Slopes of Pond	Erosion	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Emergency Overflow Spillway and Berms over 4 feet in height.	Tree Growth	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Piping	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Emergency Overflow Spillway	Rock Missing	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Erosion	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Pre-settling Ponds and Vaults	Facility or sump filled with Sediment and/or debris	6" or designed sediment trap depth of sediment.	Sediment is removed.

Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Storage Area	Plugged Air Vents	One-half of the cross section of a vent is blocked at any point or the vent is damaged.	Vents open and functioning.
	Debris and Sediment	Accumulated sediment depth exceeds 10% of the diameter of the storage area for 1/2 length of storage vault or any point depth exceeds 15% of diameter. (Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than 1/2 length of tank.)	All sediment and debris removed from storage area.
	Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into facility. (Will require engineering analysis to determine structural stability).	All joint between tank/pipe sections are sealed.
	Tank Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10% of its design shape. (Review required by engineer to determine structural stability).	Tank/pipe repaired or replaced to design.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch and any evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determines that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls.	Vault replaced or repaired to design specifications and is structurally sound. No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe.

Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults) (continued)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins

Table V-A.4: Maintenance Standards - Control Structure/Flow Restrictor

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris (Includes Sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
	Structural Damage	Structure is not securely attached to manhole wall. Structure is not in upright position (allow up to 10% from plumb). Connections to outlet pipe are not watertight and show signs of rust. Any holes - other than designed holes - in the structure.	Structure securely attached to wall and outlet pipe. Structure in correct position. Connections to outlet pipe are water tight; structure repaired or replaced and works as designed. Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing. Gate cannot be moved up and down by one maintenance person. Chain/rod leading to gate is missing or damaged. Gate is rusted over 50% of its surface area.	Gate is watertight and works as designed. Gate moves up and down easily and is watertight. Chain is in place and works as designed. Gate is repaired or replaced to meet design standards.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Manhole	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)
Catch Basin	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins

Table V-A.5: Maintenance Standards - Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%. Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe. Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height. Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No Trash or debris located immediately in front of catch basin or on grate opening. No trash or debris in the catch basin. Inlet and outlet pipes free of trash or debris. No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin). Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Top slab is free of holes and cracks. Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound. Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Basin replaced or repaired to design standards. Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening. Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation blocking opening to basin. No vegetation or root growth present.
	Contamination and Pollution	See Table V-A.1: Maintenance Standards - Detention Ponds	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Cover/grate is in place, meets design standards, and is secured
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place, meets the design standards, and is installed and aligned with the flow path.

ATTACHMENT E – DETENTION FACILITY SIZING EXHIBIT

Table 1

ON-SITE DETENTION DESIGN FOR PROJECTS BETWEEN 500 SF AND 9,500 SF NEW PLUS REPLACED IMPERVIOUS SURFACE AREA

New and Replaced Impervious Surface Area (sf)	Detention Pipe Diameter (in)	Detention Pipe Length (ft)		Lowest Orifice Diameter (in)[3]		Distance from Outlet Invert to Second Orifice (ft)		Second Orifice Diameter (in)	
		B soils	C soils	B soils	C soils	B soils	C soils	B soils	C soils
500 to 1,000 sf	36"	30	22	0.5	0.5	2.2	2.0	0.5	0.8
	48"	18	11	0.5	0.5	3.3	3.2	0.9	0.8
	60"	11	7	0.5	0.5	4.2	3.4	0.5	0.6
1,001 to 2,000 sf	36"	66	43	0.5	0.5	2.2	2.3	0.9	1.4
	48"	34	23	0.5	0.5	3.2	3.3	0.9	1.2
	60"	22	14	0.5	0.5	4.3	3.6	0.9	0.9
2,001 to 3,000 sf	36"	90	66	0.5	0.5	2.2	2.4	0.9	1.9
	48"	48	36	0.5	0.5	3.1	2.8	0.9	1.5
	60"	30	20	0.5	0.5	4.2	3.7	0.9	1.1
3,001 to 4,000 sf	36"	120	78	0.5	0.5	2.4	2.2	1.4	1.6
	48"	62	42	0.5	0.5	2.8	2.9	0.8	1.3
	60"	42	26	0.5	0.5	3.8	3.9	0.9	1.3
4,001 to 5,000 sf	36"	134	91	0.5	0.5	2.8	2.2	1.7	1.5
	48"	73	49	0.5	0.5	3.6	2.9	1.6	1.5
	60"	46	31	0.5	0.5	4.6	3.5	1.6	1.3
5,001 to 6,000 sf	36"	162	109	0.5	0.5	2.7	2.2	1.8	1.6
	48"	90	59	0.5	0.5	3.5	2.9	1.7	1.5
	60"	54	37	0.5	0.5	4.6	3.6	1.6	1.4
6,001 to 7,000 sf	36"	192	128	0.5	0.5	2.7	2.2	1.9	1.8
	48"	102	68	0.5	0.5	3.7	2.9	1.9	1.6
	60"	64	43	0.5	0.5	4.6	3.6	1.8	1.5
7,001 to 8,000 sf	36"	216	146	0.5	0.5	2.8	2.2	2.0	1.9
	48"	119	79	0.5	0.5	3.8	2.9	2.2	1.7
	60"	73	49	0.5	0.5	4.5	3.6	2.0	1.6
8,001 to 8,500 sf[1]	36"	228	155	0.5	0.5	2.8	2.2	2.1	1.9
	48"	124	84	0.5	0.5	3.7	2.9	1.9	1.8
	60"	77	53	0.5	0.5	4.6	3.6	2.0	1.6
8,501 to 9,000 sf	36"	NA [1]	164	0.5	0.5	NA [1]	2.2	NA [1]	1.9
	48"	NA [1]	89	0.5	0.5	NA [1]	2.9	NA [1]	1.9
	60"	NA [1]	55	0.5	0.5	NA [1]	3.6	NA [1]	1.7
9,001 to 9,500 sf[2]	36"	NA [1]	174	0.5	0.5	NA [1]	2.2	NA [1]	2.1
	48"	NA [1]	94	0.5	0.5	NA [1]	2.9	NA [1]	2.0
	60"	NA [1]	58	0.5	0.5	NA [1]	3.7	NA [1]	1.7

Notes:

▪ Minimum Requirement #7 (Flow Control) is required when the 100-year flow frequency causes a 0.15 cubic feet per second increase (when modeled in WWHM with a 15-minute timestep). Breakpoints shown in this table are based on a flat slope (0-5%). The 100-year flow frequency will need to be evaluated on a site-specific basis for projects on moderate (5-15%) or steep (> 15%) slopes.

▪ Soil type to be determined by geotechnical analysis or soil map.

▪ Sizing includes a Volume Correction Factor of 120%.

▪ Upper bound contributing area used for sizing.

[1] On Type B soils, new plus replaced impervious surface areas exceeding 8,500 sf trigger Minimum Requirement #7 (Flow Control)

[2] On Type C soils, new plus replaced impervious surface areas exceeding 9,500 sf trigger Minimum Requirement #7 (Flow Control)

[3] Minimum orifice diameter = 0.5 inches

in = inch

ft = feet

sf = square feet

Basis of Sizing Assumptions:

Sized per MR#5 in the Stormwater Management Manual for Puget Sound Basin (1992 Ecology Manual)

SBUH, Type 1A, 24-hour hydrograph

2-year, 24-hour storm = 2 in; 10-year, 24-hour storm = 3 in; 100-year, 24-hour storm = 4 in

Predeveloped = second growth forest (CN = 72 for Type B soils, CN = 81 for Type C soils)

Developed = impervious (CN = 98)

0.5 foot of sediment storage in detention pipe

Overland slope = 5%

ATTACHMENT F – ARBORIST REPORT

Artist Touch Landscaping
Landscape Design + Consulting Arborist

Arborist Tree Inventory Preliminary Report

Client: TEKIELA REVOCABLE INTER VIV

Job Site: 6520 82nd Ave SE Mercer Island, WA

Parcel: 6669200170

Subject: Arborist Tree Inventory Preliminary Report

Date: 12/27/2023

From: Adam C Harke, ISA Certified Arborist #PN-9506A, Tree Risk Assessor Qualified

Assignment

I walked the site to inspect the trees and document my findings.

A summary, tree table, site map, and photographic documentation can be found below under sections 1 - 5. I have also attached the relevant current King County tree code at the end of this report.

Where applicable, I have categorized risk based on the methodologies presented in the International Society of Arboriculture's Tree Risk Assessment (Best Management Practices).

My responsibilities were to provide the following:

A tree plan that includes a tree inventory, site plan, replanting information (if necessary), tree protection measures for on-site and off-site trees (where CRZ extends on-site), and recommendations that will meet the minimum King County tree code requirements.

Site Description: Residential House with established landscape.

Subject Trees – Several Cherry trees, Incense Cedar, Western Hemlock, Flowering Dogwood, and Holly.

Artist Touch Landscaping LLC
9608 Wall ST Snohomish, WA 98296
(360)739-5236 artisttouch@mac.com

1. Summary

This report is preliminary as I have not reviewed any design plans or construction details for the site. Tree locations are based on a provided survey, KC Parcel Viewer data, and conditions observed during my site visit.

Retained trees will require protection measures to ensure they are not significantly impacted by construction. City Of Mercer Island tree protection measures, fencing details, and ISA recommended tree protection guidelines can be found below.

---

2. Tree Protection Timeline and Site Recommendations

Prior to construction, the following measures should be taken to ensure that trees are not damaged.

1) Project managers should review the contents of this report, including the International Society of Arboriculture's recommended tree protection measures found below under section 6 of this report. Information contained herein should be relayed to workers and subcontractors.

2) To minimize soil compaction, 6 – 10 inches of medium fine mulch should be applied within the recommended tree protection zones of this report. It should be kept at a minimum of 12 inches from the protected tree's trunk.

Once the mulch has been applied, tree protection fencing should be installed per the **King County tree and vegetation protection detail** found below.

Additional site recommendations.

- Tree protection fencing and mulch should only be adjusted when access is required, such as, when scaffolding is utilized. Once the work has been completed, the fencing should return to its original placement.
- The following should be avoided within TPZ's: Stockpile construction materials or demolition debris, park vehicles or equipment, pile soil and/or mulch, contaminate soil from washing out equipment (especially concrete) and vehicle maintenance, and wound or break tree trunks or branches through contact with vehicles and heavy equipment.
- Post appropriate signage to help convey the importance of the TPZ to workers.
- **Make all necessary cuts to tree roots cleanly with sharp tools; never tear with a backhoe**. A clean cut encourages good wound closure and confines the spread of decay.
- All pruning should be conducted by an International Society of Arboriculture (ISA) certified arborist and following current ANSI A300 specifications.
- The project arborist shall supervise that the tree protection plan is being implemented.

Artist Touch Landscaping LLC
9608 Wall ST Snohomish, WA 98296
(360)739-5236 artisttouch@mac.com

Artist Touch Landscaping
Landscape Design + Consulting Arborist

3. Tree Inventory Table

Tree ID#	Parcel/ Location	Species	DBH Inches	Health Condition	Structural Condition	TRZ Radius	Overall Risk Rating	Proposed Action	Comment
395	6669200170	Incense Cedar *Calocedrus decurrens*	12”,10”	GOOD	GOOD	10’	Low	Retain	
396	6669200170	Flowering Cherry *Prunus serrulata*	12”	GOOD	FAIR	12’	Low	Remove	Poorly pruned
397	6669200170	Star Magnolia *Magnolia stelleta*	6”	GOOD	GOOD	6’	Low	Retain	
398	6669200170	English Holly *Ilex aquifolium*	7”	GOOD	GOOD	7’	Low	Retain	
399	6669200170	Flowering Dogwood *Cornus florida*	5”	GOOD	GOOD	5’	Low	Retain	
400	6669200170	Western Hemlock *Tsuga heterophylla*	10”	GOOD	POOR	10’	Low	Retain	Tree Has been Topped.
003	6669200170	Flowering Cherry *Prunus serrulata*	9”	POOR	POOR	9’	Low	Remove	Damaged due to very poor pruning
241	6669200170	Black Tupelo *Nyssa sylvatica*	9”	GOOD	GOOD	9’	Low	Retain	
284	6669200170	Flowering Cherry *Prunus serrulata*	9”,9”	POOR	POOR	9’	Low	Remove	Damaged due to very poor pruning
286	6669200170	Flowering Dogwood *Cornus florida*	8”	POOR	POOR	8’	Low	Remove	Damaged due to very poor pruning
687	6669200170	Japanese Maple *Acer palmatum*	10”	GOOD	GOOD	10’	Low	Retain	
688	6669200170	Flowering Cherry *Prunus serrulata*	12”	GOOD	GOOD	12’	Low	Retain	
689	6669200170	Flowering Cherry *Prunus serrulata*	12”	GOOD	GOOD	12’	Low	Retain	

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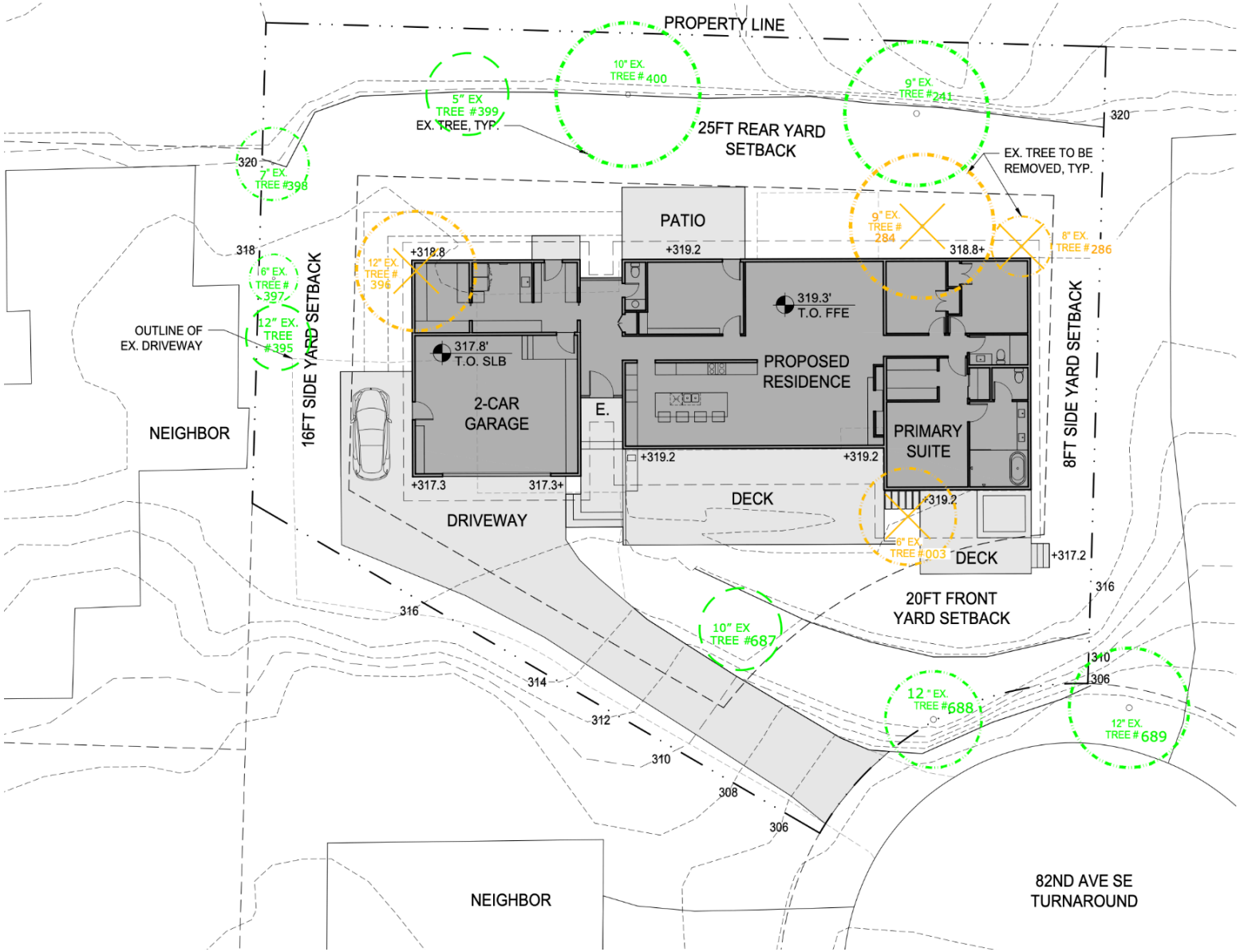
4. Site Map



TEKIELA RESIDENCE

2023-11-22

SITE PLAN
1/16"=1'-0"

LOT AREA = 15,178 SF
LOT COVERAGE = 6,071 SF MAX
ROOF = 4,554 SF
DRIVE = 1,512 SF
TOTAL = 6,066 SF PROPOSED

GROSS FLOOR AREA = 6,071 SF MAX
TOTAL = 3,782 SF PROPOSED

HARDSCAPE MAX = 1,366 SF MAX
TOTAL = 842 SF PROPOSED

REQ'D LANDSCAPING = 9,107 SF MIN.
TOTAL = 10,204 SF PROPOSED

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5. Photographic Documentation

#395 Incense Cedar

#396 Flowering Cherry

#397 Star Magnolia

#398 English Holly

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#399 Flowering Dogwood

#400 Western Hemlock

#003 Flowering Cherry

#241 Black Tupela

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#284 Flowering Cherry

#286 Codominant Flowering Dogwood

#687 Japanese Maple

#688 Flowering Cherry

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ADDITIONAL PHOTO UPDATE
#689

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6. Details of Risk Assessment

Level 2: Basic Assessment

A level 2 basic assessment is the standard assessment performed for tree risk. The assessment includes a detailed visual inspection of a tree and its surrounding site, and a synthesis of the information collected. The basic assessment involves walking completely around the tree – looking at the site, buttress roots, trunk, and branches. The tree is viewed from a distance, as well as close up, to consider crown shape and surroundings.

Methodology – When identifying potential hazard trees, I must consider a variety of factors that could contribute to failure. This can include the following: previous history of site failures, topography, site changes, prevailing wind direction and exposure, tree size and species, growth habit, overall vigor, the density and health of the foliage and crown, examination of root and root collar health, dead wood, hanging or broken branches, and evidence of disease-causing bacteria, fungi, or virus.

Tools Utilized: Binoculars, compass, hammer, diameter tape, clinometer.

Timeline – This assessment covers a five-year period and is based on conditions present at the time of the assessment.

7. Definitions:

Diameter at Breast Height (DBH) – The diameter or thickness of a tree trunk measured at 4.5 feet above average grade. For trees with multiple trunks at 4.5 feet height, only trunks 3” DBH or greater shall be included. Where a tree splits into several trunks close to ground level, the DBH for the tree is the square root of the sum of the DBH for each individual stem squared (example with 3 trunks: DBH = square root [(stem1)2 + (stem2)2 + (stem3)2]). If a tree has been removed and only the stump remains that is below 4.5 feet tall, the size of the tree shall be the diameter of the top of the stump.

Significant – Trees with trunks greater than 6 inches in diameter, measured 4½ ft from the ground.

Landmark Tree – A regulated tree with a minimum 26-inch DBH.

Grove – A group of three or more viable regulated trees with overlapping or touching crowns that are located on a proposed development site; one of which is located in a required yard.

Dripline – The distance from the tree trunk that is equal to the furthest extent of the tree’s crown. For trees with asymmetrical crowns, the dripline shall be measured in all four cardinal directions (North, South, East, West).

Tree Protection Zone (TPZ) – A defined area within and including an outer boundary, as determined by a Qualified Professional Arborist, in which certain activities are prohibited or restricted to prevent or minimize potential impacts from construction or development, applicable to individual trees or groups of tree trunks, roots and soil. TPZ is measured in feet from the face of the trunk and may be determined using Critical Root Zone, dripline, exploratory root excavations or other methodologies. The TPZ is variable depending on species, age and health of the tree, soil conditions and proposed construction. TPZ denotes the location of tree protection fencing.

Referenced City Of Mercer Island Code:

Tree Permits Related to Development Proposals

https://www.mercerisland.gov/cpd/page/tree-permits-related-development-proposals

Trees and construction
https://www.mercerisland.gov/sites/default/files/fileattachments/community_planning_amp_development/page/21988/treesandconstruction.pdf

Tree Submittal Checklist
https://www.mercerisland.gov/sites/default/files/fileattachments/community_planning_amp_development/page/21988/treessubmittalchecklist.pdf

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8. ISA Recommended Tree Protection Information

The Pacific Northwest Chapter of the ISA Recommends the following for protecting trees from damage during construction.

https://pnwisa.org/tree-care/damage/protecting-trees-from-damage/

Critical Root Zone Protection

A critical step in retaining healthy trees is the protection of tree roots from disturbance. Each tree has a critical root zone (CRZ) that varies by species and site conditions. The International Society of Arboriculture defines CRZ as an area equal to a 1-foot radius from the base of the tree's trunk for each 1 inch of the tree's diameter at 4.5 feet above grade (referred to as diameter at breast height).

Another common rule of thumb is to use a tree's drip line to estimate the CRZ (see figure). Evaluate both of these and choose whichever provides the larger CRZ.

Under certain circumstances, disturbing or cutting roots in a CRZ may be unavoidable. In such cases, the work should be done only under the on-site supervision of an ISA Certified Arborist.

Cutting or disturbing a large percentage of a tree's roots increases the likelihood of the tree's failure or death. Never cut tree roots that are more than four inches wide; roots that large are usually structural. Cutting them can destroy the stability of the tree, causing it to fall over!

If you must cut tree roots, do so cleanly with sharp tools. Never tear with a backhoe or other dull instrument. A clean cut encourages good wound closure and confines the spread of decay. If damage is severe, consider removing the tree because its stability may have been compromised.

Activities to Avoid in the Critical Root Zone

The CRZ that should be protected from negative interactions. Avoid the following activities:

- Stockpiling construction materials or demolition debris
- Parking vehicles or equipment
- Piling soil and/or mulch
- Trenching for utilities installation or repair, or for irrigation system installation
- Changing soil grade by cutting or filling
- Damaging roots by grading, tearing, or grubbing
- Compacting soil with equipment, vehicles, material storage, and/or foot traffic
- Contaminating soil from washing out equipment (especially concrete) and vehicle maintenance
- Installing impervious parking lots, driveways, and walkways
- Attaching anything to trees using nails, screws, or spikes
- Wounding or breaking tree trunks or branches through contact with vehicles and heavy equipment
- Wounding trunks with string weed trimmers and lawn mowers
- Causing injury by fire or excessive heat

During Construction

Monitor compliance with tree protection requirements and the impacts of construction activities on tree health regularly during construction. If there are incursions into the root zone, ensure roots have been severed cleanly, enforce penalties, and reestablish the protection zone. Confer with your contractors to make sure that construction offices, vehicular parking, worker break sites, concrete washout areas or other pollutants, and material storage will remain outside of protected areas. Diligence in maintaining barriers and in enforcing your protection plan will pay great dividends at the end of the project when the tree is still healthy.

Following the guidelines laid out above will serve in most situations, but occasionally construction plans will require impingement on the CRZ.

Trenching

Trenching is a standard way to install utilities. **It is best to entirely avoid trenching through the CRZ** (see figure); such practice could severely destabilize a tree, as well as adversely affect its health through loss of roots. Workers performing such operations should understand that 85% of the mass of a tree's root system is located within the CRZ and that most of a tree's roots are within the top 18 inches of soil. Alter routes of underground infrastructure or use alternate methods such as pipe boring. Tunneling at least 18 inches beneath the root zone will prevent loss of critical root mass if underground utilities must unavoidably be placed within the CRZ.

A decision must be made as to where best to locate utility trenches. Planners and designers must be made aware that trenches may not cross a CRZ and design alternate alignments accordingly; such realignments are not the responsibility of the construction crew.

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Best practices for trenching include the following:

- Protect the trunks of high-value trees from scraping and gouging to a height of at least eight feet.
- Keep equipment and excavated backfill on the side furthest from the tree, not against the trunk.
- Place excavated backfill on a plastic or canvas tarp outside the CRZ.
- Prune away jagged roots back to the trench wall closest to the tree. Use a handheld pruner or pruning saw to make sharp, clean cuts.
- Replace the backfill on the same day if at all possible. Cover exposed roots with wet burlap to prevent them from drying out; in hot dry conditions, small roots may be injured in as little as 30 minutes.
- Do not allow chemicals, trash, or other foreign debris to become mixed with the backfill.
- If earthwork specifications allow it, firm the backfill to the same compaction as the surrounding soil and no more.
- Water the backfill to prevent excessive root drying.

Grade or Ground Level Changes

Grade changes should be avoided in order to prevent serious damage or death to a tree. Fill that is added over existing soils can smother and kill roots, or invite disease if piled around the trunk. Even temporary fills such as stockpiling mulch or soil in the CRZ of a tree for as little as several days during the construction process can have severe, long-term negative effects, though symptoms may not appear for several years.

The extent of injury from adding soil around a tree varies with the kind, age, and condition of the tree; the depth and type of fill; drainage; and several other factors. Maple, oak, and evergreens are most susceptible, while elm, ash, willow, sycamore, and locust are least affected.

Little can be done to save trees that have been suffering from soil added over an extended period of time. It is prudent to consider possible damage that may occur to a tree and take alternative action before the fill is made; prevention is less expensive and more effective than attempting to correct the situation after damage has been done.

Best practices for fill operations include the following:

- Never place any fill or organic materials directly against the tree.
- Never compact the soil within the CRZ.
- If using no more than two to four inches of fill around existing trees, significant damage may be avoided if the fill has a coarser texture than the existing soil.

Less damage to a tree's roots is likely with a lowered grade than when it is raised, unless exposing or removing a great deal of the root mass. A general rule-of-thumb used by landscape architects is to remove no more than six inches of soil from the existing grade in the CRZ; however, this is dependent on the soils in which the tree is growing. A tree's roots may all exist in the top foot of a shallow soil; removing the top six inches would have tremendous negative impact in that case.

Best practices for removing soil include the following:

- Consider removal and replacement if the tree is young, in poor condition, an undesirable species, or very susceptible to insects and disease.
- Plan grade changes well in advance of construction using the appropriate method to prevent injury to desirable trees.
- Use retaining walls or terraces to avoid excessive soil loss in the area of greatest root growth.
- Spread mulch over the exposed root area when possible, to help prevent soil erosion, reduce moisture loss, and keep soil temperatures lower.
- Provide supplementary water when rainfall is less than one inch per week.
- Prune roots to prepare the tree for root loss due to grade lowering. Root pruning is best left to an ISA Certified Arborist, who can take into account the variables necessary to reduce the stress of the pruning to the tree.

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9. Certificate of Performance

I, Adam C Harke, certify that:

- I have personally inspected the trees and the property referred to in this report and have stated my findings accurately.
- I have no current or prospective interest in the vegetation or the property that is the subject of this report and have no personal interest or bias with respect to the parties involved.
- The analysis, opinion, and conclusions stated herein are my own and are based on current industry standards, scientific procedures, and facts.
- My analysis, opinion, and conclusions were developed, and this report has been prepared according to commonly accepted arboriculture practices.
- No one provided significant professional assistance to me, except as indicated within the report.
- My compensation is not contingent upon the reporting of predetermined conclusions that favors the cause of the client or any other party nor upon the results of the assessment, the attainment of stipulated results, or the occurrence of any subsequent events.

I further certify that I am a member in good standing of the International Society of Arboriculture (ISA) and an ISA Certified Arborist (#PN-9506A) and Tree Risk Assessment Qualified.

If you have any questions about this report, please contact me at 360-739-5236 or artisttouch@mac.com.

Adam C Harke

References:

Dirr, Michael A. *Manual of Woody Landscape Plants Their Identification, Ornamental Characteristics, Culture, Propagation, and Use.* Stripes Publishing L.L.C., 2009

Smiley, E. Thomas, Nelda Matheny, and Sharon Lilly. *Tree Risk Assessment (Best Management Practices, Second Edition)*. Champaign: International Society of Arboriculture, 2017.

Dunster, Julian A., E. Thomas Smiley, Nelda Matheny, and Sharon Lilly. Tree Risk Assessment Manual. Champaign, Illinois: International Society of Arboriculture, 2013.

Shigo, Alex L. *A New Tree Biology: Facts, Photos, and Philosophies on Trees and Their Problems and Proper Care*. Shigo and Trees, Associates, 1986.

10. Credentials & Experience

Certified Arborist and Qualified Tree Risk Assessor, through the International Society of Arboriculture #PN-7375A.

To earn an ISA Certified Arborist® credential, you must be trained and knowledgeable in all aspects of arboriculture. ISA Certified Arborist® have met all requirements to be eligible for the exam, which includes three or more years of full-time, eligible, practical work experience in arboriculture and/or a degree in the field of arboriculture, horticulture, landscape architecture, or forestry from a regionally accredited educational institute. This certification covers a large number of topics giving the candidates flexibility in the arboricultural profession. A code of ethics for ISA Certified Arborists® strengthens the credibility and reliability of the work force. This certification is accredited by the American National Standards Institute, meeting, and exceeding ISO 17024.

11. Assumptions & Limiting Conditions

a) A field examination of the site was made on ***12/20/2023***. My observations and conclusions are as of that date.
b) Care has been taken to obtain all information from reliable sources. All data has been verified insofar as possible; however, the consultant/arborist can neither guarantee nor be responsible for accuracy of information provided by others.
c) Unless stated otherwise: 1) information contained in this report covers only those trees that were examined and reflects the conditions of those trees at the time of inspection; and 2) the inspection is limited to visual examination of the subject trees without dissection, excavation, probing, or coring. There is no warranty or guarantee, expressed or implied that problems or deficiencies of the subject tree may not arise in the future.
d) All trees possess the risk of failure. Trees can fail at any time, with or without obvious defects, and with or without applied stress. A complete evaluation of the potential for this (a) tree to fail requires excavation and examination of the base of the subject tree. Permission of the current property owner must be obtained before this work can be undertaken and the hazard evaluation completed.
e) Other trees with similar defects are standing in the neighborhood and have been so for some time. Trees are living biological organisms, and I cannot predict nor guarantee their stability or failure.
f) Sketches, drawings, and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural report of surveys unless expressed otherwise. The reproduction of any information generated by architects, engineers, or other consultants on any sketches, drawings, or photographs is for the express purpose of coordination and ease of reference only. Inclusion of said information on any drawings or other documents does not constitute a representation by Tree Frog LLC as to the sufficiency or accuracy of said information.
g) The consultant/appraiser shall not be required to give testimony or attend court because of this report unless subsequent contractual arrangements are made.
h) Loss or alteration of any part of this report invalidates the entire report.
i) Unless required by law otherwise, possession of this report or a copy thereof does not imply right of publication or use for any purpose by any other than the person to whom it is addressed, without the prior expressed written or verbal consent of the consultant/appraiser.

ATTACHMENT G – WWHM REPORT

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: WWHM

Site Name:	6520 82nd Ave SE
Site Address:	6520 82nd Ave SE
City:	Mercer Island
Report Date:	5/31/2024
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2023/01/27
Version:	4.2.19

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Pasture, Mod	0.348
Pervious Total	0.348
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.348

Mitigated Land Use

Roof

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROOF TOPS FLAT	0.104
Impervious Total	0.104
Basin Total	0.104

Driveway and walkway to detention

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	0.062
Impervious Total	0.062
Basin Total	0.062

Basin 3

Bypass:	Yes
GroundWater:	No
Pervious Land Use	acre
A B, Lawn, Mod	0.182
Pervious Total	0.182
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.182

Routing Elements
Predeveloped Routing

Mitigated Routing

Tank 1

Dimensions
Depth: 5 ft.
Tank Type: Circular
Diameter: 5 ft.
Length: 73 ft.
Discharge Structure
Riser Height: 5 ft.
Riser Diameter: 6 in.
Orifice 1 Diameter: 0.700 in. Elevation:-1.5 ft.
Orifice 2 Diameter: 2.000 in. Elevation:4.5 ft.
Element Flows To:
Outlet 1 Outlet 2

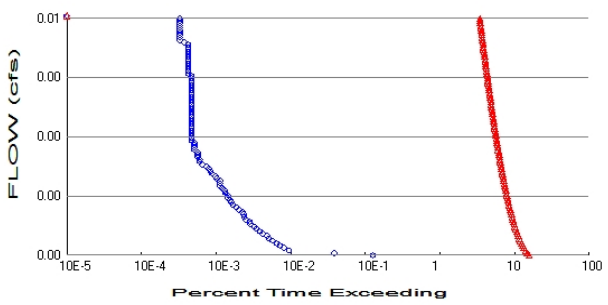
Tank Hydraulic Table

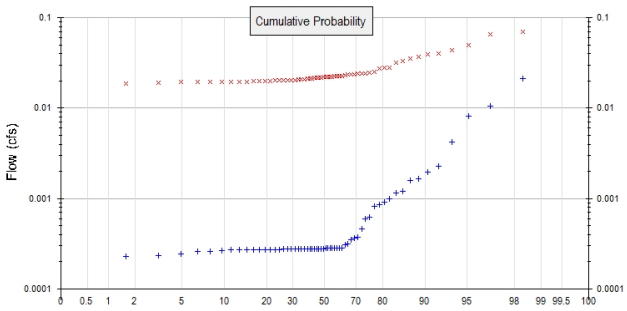
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
309.40	0.000000	0.000000	0.016	0.000
309.46	0.001757	0.000065	0.016	0.000
309.51	0.002470	0.000184	0.016	0.000
309.57	0.003008	0.000337	0.017	0.000
309.62	0.003454	0.000516	0.017	0.000
309.68	0.003839	0.000719	0.017	0.000
309.73	0.004180	0.000942	0.018	0.000
309.79	0.004488	0.001183	0.018	0.000
309.84	0.004769	0.001440	0.018	0.000
309.90	0.005028	0.001713	0.018	0.000
309.96	0.005267	0.001999	0.019	0.000
310.01	0.005489	0.002297	0.019	0.000
310.07	0.005697	0.002608	0.019	0.000
310.12	0.005891	0.002930	0.019	0.000
310.18	0.006074	0.003263	0.020	0.000
310.23	0.006246	0.003605	0.020	0.000
310.29	0.006407	0.003956	0.020	0.000
310.34	0.006560	0.004317	0.020	0.000
310.40	0.006703	0.004685	0.021	0.000
310.46	0.006839	0.005061	0.021	0.000
310.51	0.006967	0.005445	0.021	0.000
310.57	0.007088	0.005835	0.021	0.000
310.62	0.007202	0.006232	0.021	0.000
310.68	0.007310	0.006635	0.022	0.000
310.73	0.007411	0.007044	0.022	0.000
310.79	0.007506	0.007459	0.022	0.000
310.84	0.007596	0.007878	0.022	0.000
310.90	0.007680	0.008303	0.023	0.000
310.96	0.007758	0.008731	0.023	0.000
311.01	0.007832	0.009164	0.023	0.000
311.07	0.007900	0.009601	0.023	0.000
311.12	0.007963	0.010042	0.023	0.000
311.18	0.008022	0.010486	0.024	0.000
311.23	0.008076	0.010933	0.024	0.000
311.29	0.008125	0.011383	0.024	0.000
311.34	0.008170	0.011836	0.024	0.000
311.40	0.008210	0.012291	0.024	0.000

311.46	0.008246	0.012748	0.025	0.000
311.51	0.008277	0.013207	0.025	0.000
311.57	0.008304	0.013668	0.025	0.000
311.62	0.008327	0.014130	0.025	0.000
311.68	0.008346	0.014593	0.025	0.000
311.73	0.008361	0.015057	0.026	0.000
311.79	0.008371	0.015522	0.026	0.000
311.84	0.008377	0.015987	0.026	0.000
311.90	0.008379	0.016453	0.026	0.000
311.96	0.008377	0.016918	0.026	0.000
312.01	0.008371	0.017383	0.027	0.000
312.07	0.008361	0.017848	0.027	0.000
312.12	0.008346	0.018312	0.027	0.000
312.18	0.008327	0.018775	0.027	0.000
312.23	0.008304	0.019237	0.027	0.000
312.29	0.008277	0.019698	0.027	0.000
312.34	0.008246	0.020157	0.028	0.000
312.40	0.008210	0.020614	0.028	0.000
312.46	0.008170	0.021069	0.028	0.000
312.51	0.008125	0.021522	0.028	0.000
312.57	0.008076	0.021972	0.028	0.000
312.62	0.008022	0.022419	0.028	0.000
312.68	0.007963	0.022863	0.029	0.000
312.73	0.007900	0.023304	0.029	0.000
312.79	0.007832	0.023741	0.029	0.000
312.84	0.007758	0.024174	0.029	0.000
312.90	0.007680	0.024603	0.029	0.000
312.96	0.007596	0.025027	0.029	0.000
313.01	0.007506	0.025447	0.030	0.000
313.07	0.007411	0.025861	0.030	0.000
313.12	0.007310	0.026270	0.030	0.000
313.18	0.007202	0.026673	0.030	0.000
313.23	0.007088	0.027070	0.030	0.000
313.29	0.006967	0.027460	0.030	0.000
313.34	0.006839	0.027844	0.031	0.000
313.40	0.006703	0.028220	0.031	0.000
313.46	0.006560	0.028589	0.031	0.000
313.51	0.006407	0.028949	0.031	0.000
313.57	0.006246	0.029300	0.031	0.000
313.62	0.006074	0.029643	0.031	0.000
313.68	0.005891	0.029975	0.032	0.000
313.73	0.005697	0.030297	0.032	0.000
313.79	0.005489	0.030608	0.032	0.000
313.84	0.005267	0.030907	0.032	0.000
313.90	0.005028	0.031193	0.032	0.000
313.96	0.004769	0.031465	0.058	0.000
314.01	0.004488	0.031722	0.069	0.000
314.07	0.004180	0.031963	0.077	0.000
314.12	0.003839	0.032186	0.084	0.000
314.18	0.003454	0.032389	0.090	0.000
314.23	0.003008	0.032569	0.096	0.000
314.29	0.002470	0.032721	0.101	0.000
314.34	0.001757	0.032840	0.106	0.000
314.40	0.000000	0.032905	0.110	0.000
314.46	0.000000	0.000000	0.183	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.348
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.182
Total Impervious Area: 0.166

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.000406
5 year	0.001016
10 year	0.001778
25 year	0.00344
50 year	0.005463
100 year	0.008485

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.023346
5 year	0.030471
10 year	0.03585
25 year	0.043432
50 year	0.049676
100 year	0.056457

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.000	0.022
1950	0.008	0.039
1951	0.002	0.028
1952	0.000	0.020
1953	0.000	0.020
1954	0.000	0.022
1955	0.000	0.024
1956	0.002	0.024
1957	0.000	0.023
1958	0.000	0.021

1959	0.000	0.020
1960	0.001	0.025
1961	0.001	0.022
1962	0.000	0.019
1963	0.000	0.019
1964	0.001	0.023
1965	0.000	0.021
1966	0.000	0.020
1967	0.001	0.037
1968	0.000	0.022
1969	0.000	0.020
1970	0.000	0.020
1971	0.000	0.021
1972	0.004	0.033
1973	0.000	0.020
1974	0.000	0.019
1975	0.000	0.023
1976	0.000	0.022
1977	0.000	0.020
1978	0.000	0.023
1979	0.000	0.021
1980	0.000	0.022
1981	0.000	0.021
1982	0.000	0.024
1983	0.000	0.022
1984	0.000	0.019
1985	0.000	0.021
1986	0.000	0.025
1987	0.000	0.024
1988	0.000	0.020
1989	0.000	0.020
1990	0.001	0.065
1991	0.001	0.036
1992	0.000	0.021
1993	0.000	0.019
1994	0.000	0.019
1995	0.001	0.022
1996	0.010	0.041
1997	0.002	0.028
1998	0.000	0.020
1999	0.002	0.044
2000	0.000	0.022
2001	0.000	0.020
2002	0.000	0.024
2003	0.000	0.020
2004	0.000	0.032
2005	0.000	0.023
2006	0.000	0.024
2007	0.021	0.070
2008	0.001	0.050
2009	0.000	0.028

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0211	0.0703
2	0.0105	0.0651
3	0.0081	0.0496

4	0.0042	0.0439
5	0.0023	0.0406
6	0.0020	0.0393
7	0.0016	0.0370
8	0.0016	0.0356
9	0.0012	0.0332
10	0.0012	0.0320
11	0.0010	0.0282
12	0.0009	0.0282
13	0.0009	0.0276
14	0.0008	0.0254
15	0.0006	0.0247
16	0.0006	0.0244
17	0.0005	0.0243
18	0.0004	0.0242
19	0.0004	0.0238
20	0.0003	0.0236
21	0.0003	0.0235
22	0.0003	0.0231
23	0.0003	0.0228
24	0.0003	0.0228
25	0.0003	0.0226
26	0.0003	0.0225
27	0.0003	0.0224
28	0.0003	0.0224
29	0.0003	0.0221
30	0.0003	0.0220
31	0.0003	0.0220
32	0.0003	0.0219
33	0.0003	0.0218
34	0.0003	0.0217
35	0.0003	0.0215
36	0.0003	0.0212
37	0.0003	0.0212
38	0.0003	0.0211
39	0.0003	0.0210
40	0.0003	0.0210
41	0.0003	0.0208
42	0.0003	0.0205
43	0.0003	0.0205
44	0.0003	0.0203
45	0.0003	0.0203
46	0.0003	0.0202
47	0.0003	0.0202
48	0.0003	0.0200
49	0.0003	0.0200
50	0.0003	0.0199
51	0.0003	0.0198
52	0.0003	0.0197
53	0.0003	0.0196
54	0.0003	0.0196
55	0.0003	0.0196
56	0.0003	0.0195
57	0.0003	0.0194
58	0.0002	0.0194
59	0.0002	0.0193
60	0.0002	0.0188
61	0.0002	0.0187

Duration Flows

The Duration Matching Failed

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0002	2695	336018	12468	Fail
0.0003	820	315913	38525	Fail
0.0003	203	299871	147719	Fail
0.0004	172	286396	166509	Fail
0.0004	153	274846	179637	Fail
0.0005	138	265007	192034	Fail
0.0005	121	256024	211590	Fail
0.0006	109	248110	227623	Fail
0.0006	102	240838	236115	Fail
0.0007	90	233993	259992	Fail
0.0007	82	228005	278054	Fail
0.0008	74	222230	300310	Fail
0.0008	69	217096	314631	Fail
0.0009	62	212113	342117	Fail
0.0009	60	207450	345750	Fail
0.0010	53	203022	383060	Fail
0.0011	51	198809	389821	Fail
0.0011	50	194809	389618	Fail
0.0012	48	191066	398054	Fail
0.0012	43	187601	436281	Fail
0.0013	40	184158	460395	Fail
0.0013	36	180864	502400	Fail
0.0014	34	177677	522579	Fail
0.0014	33	174704	529406	Fail
0.0015	31	171795	554177	Fail
0.0015	31	168993	545138	Fail
0.0016	29	166234	573220	Fail
0.0016	28	163582	584221	Fail
0.0017	26	161165	619865	Fail
0.0017	24	158726	661358	Fail
0.0018	24	156374	651558	Fail
0.0019	24	153999	641662	Fail
0.0019	22	151796	689981	Fail
0.0020	21	149722	712961	Fail
0.0020	19	147775	777763	Fail
0.0021	18	145679	809327	Fail
0.0021	17	143711	845358	Fail
0.0022	16	141829	886431	Fail
0.0022	14	139904	999314	Fail
0.0023	13	138065	1062038	Fail
0.0023	13	136247	1048053	Fail
0.0024	12	134536	1121133	Fail
0.0024	12	132803	1106691	Fail
0.0025	12	131156	1092966	Fail
0.0025	11	129531	1177554	Fail
0.0026	11	127948	1163163	Fail
0.0026	11	126365	1148772	Fail
0.0027	11	124782	1134381	Fail
0.0028	10	123306	1233060	Fail
0.0028	10	121766	1217660	Fail
0.0029	10	120376	1203760	Fail
0.0029	10	118986	1189860	Fail
0.0030	10	117638	1176380	Fail
0.0030	10	116291	1162910	Fail

0.0031	10	114922	1149220	Fail
0.0031	10	113660	1136600	Fail
0.0032	10	112355	1123550	Fail
0.0032	10	111158	1111580	Fail
0.0033	10	109896	1098960	Fail
0.0033	10	108655	1086550	Fail
0.0034	10	107500	1075000	Fail
0.0034	10	106281	1062810	Fail
0.0035	10	105147	1051470	Fail
0.0036	10	104078	1040780	Fail
0.0036	10	103030	1030300	Fail
0.0037	10	101960	1019600	Fail
0.0037	10	100912	1009120	Fail
0.0038	10	99843	998430	Fail
0.0038	10	98816	988159	Fail
0.0039	10	97854	978540	Fail
0.0039	10	96848	968480	Fail
0.0040	10	95886	958859	Fail
0.0040	10	94923	949230	Fail
0.0041	10	94047	940470	Fail
0.0041	10	93063	930630	Fail
0.0042	10	92143	921430	Fail
0.0042	9	91245	1013833	Fail
0.0043	9	90325	1003611	Fail
0.0043	9	89405	993388	Fail
0.0044	9	88507	983411	Fail
0.0045	9	87587	973188	Fail
0.0045	9	86710	963444	Fail
0.0046	9	85876	954177	Fail
0.0046	9	85063	945144	Fail
0.0047	9	84250	936111	Fail
0.0047	9	83438	927088	Fail
0.0048	9	82604	917822	Fail
0.0048	9	81769	908544	Fail
0.0049	9	81042	900466	Fail
0.0049	8	80272	1003400	Fail
0.0050	7	79502	1135742	Fail
0.0050	7	78775	1125357	Fail
0.0051	7	78026	1114657	Fail
0.0051	7	77235	1103357	Fail
0.0052	7	76529	1093271	Fail
0.0053	7	75802	1082885	Fail
0.0053	7	75096	1072800	Fail
0.0054	7	74390	1062714	Fail
0.0054	7	73706	1052942	Fail
0.0055	7	73043	1043471	Fail

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Tank 1 POC	☐	23.74			☐	0.00			
Total Volume Infiltrated		23.74	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

Model Default Modifications

Total of 0 changes have been made.

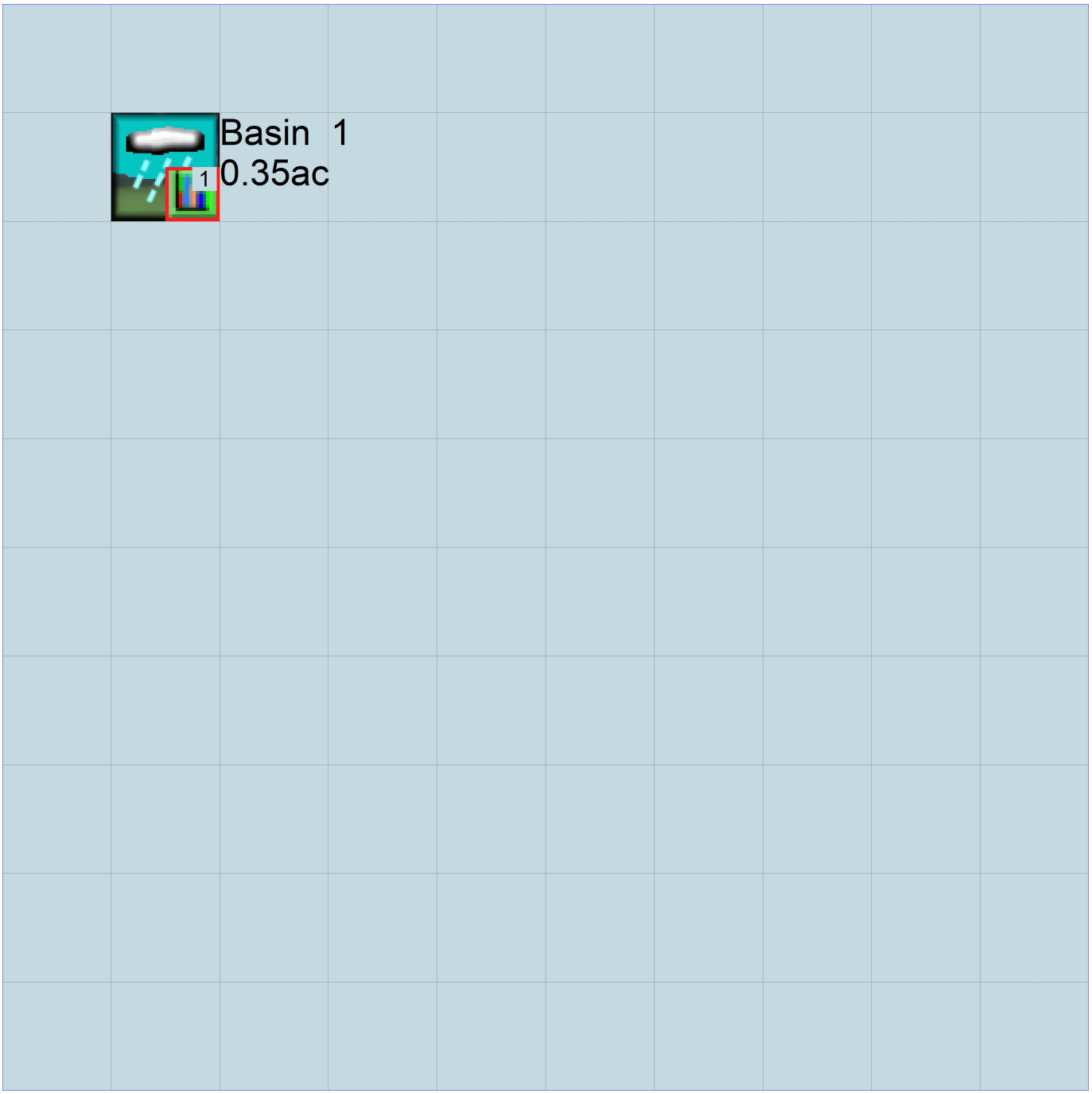
PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic

Predeveloped UCI File

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   WWHM.wdm
MESSU       25   MitWWHM.MES
            27   MitWWHM.L61
            28   MitWWHM.L62
            30   POCWWHM1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      IMPLND       4
      IMPLND       1
      PERLND       8
      RCHRES       1
      COPY         1
      COPY       501
      COPY       601
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Tank  1                    MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  601         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
    8     A/B, Lawn, Mod          1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    8         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY
```

```
  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    8         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    8         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    8              0         5       0.8       400       0.1       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    8              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                  ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    8          0.1       0.5      0.25         0       0.7      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS       IFWS       LZS       AGWS      GWVS
    8              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    4      ROOF TOPS/FLAT         1    1    1   27    0
    1      ROADS/FLAT             1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    4         0    0    1    0    0    0
    1         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    4         0    0    4    0    0    4    1    9
    1         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    4         0    0    0    0    0
    1         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
```

```
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    4            400      0.01       0.1       0.1
    1            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    4              0         0
    1              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    4              0         0
    1              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Roof***
IMPLND   4                        0.104     RCHRES   1      5
Driveway and walkway to detention***
IMPLND   1                        0.062     RCHRES   1      5
Basin  3***
PERLND   8                        0.182     COPY   501     12
PERLND   8                        0.182     COPY   601     12
PERLND   8                        0.182     COPY   501     13
PERLND   8                        0.182     COPY   601     13

******Routing******
IMPLND   4                        0.104     COPY     1     15
IMPLND   1                        0.062     COPY     1     15
RCHRES   1                            1     COPY   501     16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                         in  out                            ***
    1     Tank  1                1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
```

```
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
    1        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1              1      0.01       0.0     309.4       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1             0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   91    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.000000  0.000000  0.016285
  0.055556  0.001757  0.000065  0.016584
  0.111111  0.002470  0.000184  0.016878
  0.166667  0.003008  0.000337  0.017166
  0.222222  0.003454  0.000516  0.017450
  0.277778  0.003839  0.000719  0.017729
  0.333333  0.004180  0.000942  0.018004
  0.388889  0.004488  0.001183  0.018275
  0.444444  0.004769  0.001440  0.018542
  0.500000  0.005028  0.001713  0.018805
  0.555556  0.005267  0.001999  0.019064
  0.611111  0.005489  0.002297  0.019320
  0.666667  0.005697  0.002608  0.019573
  0.722222  0.005891  0.002930  0.019822
  0.777778  0.006074  0.003263  0.020068
  0.833333  0.006246  0.003605  0.020312
  0.888889  0.006407  0.003956  0.020552
  0.944444  0.006560  0.004317  0.020790
  1.000000  0.006703  0.004685  0.021024
  1.055556  0.006839  0.005061  0.021257
  1.111111  0.006967  0.005445  0.021487
  1.166667  0.007088  0.005835  0.021714
  1.222222  0.007202  0.006232  0.021939
  1.277778  0.007310  0.006635  0.022162
  1.333333  0.007411  0.007044  0.022382
  1.388889  0.007506  0.007459  0.022601
  1.444444  0.007596  0.007878  0.022817
  1.500000  0.007680  0.008303  0.023031
  1.555556  0.007758  0.008731  0.023243
  1.611111  0.007832  0.009164  0.023454
  1.666667  0.007900  0.009601  0.023662
  1.722222  0.007963  0.010042  0.023869
  1.777778  0.008022  0.010486  0.024074
  1.833333  0.008076  0.010933  0.024277
  1.888889  0.008125  0.011383  0.024478
  1.944444  0.008170  0.011836  0.024678
  2.000000  0.008210  0.012291  0.024876
  2.055556  0.008246  0.012748  0.025073
```

```
  2.111111  0.008277  0.013207  0.025268
  2.166667  0.008304  0.013668  0.025462
  2.222222  0.008327  0.014130  0.025654
  2.277778  0.008346  0.014593  0.025845
  2.333333  0.008361  0.015057  0.026034
  2.388889  0.008371  0.015522  0.026222
  2.444444  0.008377  0.015987  0.026409
  2.500000  0.008379  0.016453  0.026594
  2.555556  0.008377  0.016918  0.026778
  2.611111  0.008371  0.017383  0.026961
  2.666667  0.008361  0.017848  0.027142
  2.722222  0.008346  0.018312  0.027323
  2.777778  0.008327  0.018775  0.027502
  2.833333  0.008304  0.019237  0.027680
  2.888889  0.008277  0.019698  0.027857
  2.944444  0.008246  0.020157  0.028033
  3.000000  0.008210  0.020614  0.028207
  3.055556  0.008170  0.021069  0.028381
  3.111111  0.008125  0.021522  0.028553
  3.166667  0.008076  0.021972  0.028725
  3.222222  0.008022  0.022419  0.028895
  3.277778  0.007963  0.022863  0.029065
  3.333333  0.007900  0.023304  0.029233
  3.388889  0.007832  0.023741  0.029401
  3.444444  0.007758  0.024174  0.029567
  3.500000  0.007680  0.024603  0.029733
  3.555556  0.007596  0.025027  0.029898
  3.611111  0.007506  0.025447  0.030062
  3.666667  0.007411  0.025861  0.030225
  3.722222  0.007310  0.026270  0.030387
  3.777778  0.007202  0.026673  0.030548
  3.833333  0.007088  0.027070  0.030708
  3.888889  0.006967  0.027460  0.030868
  3.944444  0.006839  0.027844  0.031026
  4.000000  0.006703  0.028220  0.031184
  4.055556  0.006560  0.028589  0.031341
  4.111111  0.006407  0.028949  0.031498
  4.166667  0.006246  0.029300  0.031653
  4.222222  0.006074  0.029643  0.031808
  4.277778  0.005891  0.029975  0.031962
  4.333333  0.005697  0.030297  0.032115
  4.388889  0.005489  0.030608  0.032268
  4.444444  0.005267  0.030907  0.032420
  4.500000  0.005028  0.031193  0.032571
  4.555556  0.004769  0.031465  0.058306
  4.611111  0.004488  0.031722  0.069054
  4.666667  0.004180  0.031963  0.077334
  4.722222  0.003839  0.032186  0.084338
  4.777778  0.003454  0.032389  0.090526
  4.833333  0.003008  0.032569  0.096133
  4.888889  0.002470  0.032721  0.101301
  4.944444  0.001757  0.032840  0.106121
  5.000000  0.001000  0.032905  0.110655
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
```

```
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
COPY   601 OUTPUT MEAN   1 1     48.4      WDM    901 FLOW     ENGL      REPL
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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Local (360)943-0304

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ATTACHMENT H – WWHM & PUMP SIZING

Storm Pump Calculator

Use this Calculator in conjunction with the Rationale Method Calculator and Isopluvial Map found in subsequent tabs.
Fill out the Rationale Mathod Calculator with information about the Pervious and Impervious Surfaces contributing Stormwater to the conveyance system that feeds the pump.
Use the Isopluvial Map as needed for Rationale Method Calculations

Flow Rates of Conveyance Systems Contributing to Pump Station:

Flow from Rationale Method: **13.000** gpm

13.0 gpm

Outputs for Pump Detail Table

Flow (gpm)	100-yr TDH
13 gpm	18.36 ft

Force Main Diam.
2 in.

IE of Lowest Inlet into Pump Station	Dist. from IE of Lowest Inlet to Top of Pump (ft)	LW Elev	Active Storage Depth (ft)	HW Elev	Highest FM Elev	LW Static Head (ft)	HW Static Head (ft)	Flow (gpm)	Flow (cfs)	FM Diam. (Inches)	FM Length (ft)	Fittings Equiv. Length (ft)	Total Length (ft)	C	hf (ft)	hf (psi)	Area (sf)	Velocity (ft/s)	Vel Head (ft)	hf+hv (ft)	HW TDH (ft)	LW TDH (ft)
302	4.90	297.10	4.90	302.00	**314.5**	17.40	12.50	13.0	0.029	**2**	**92**	92	184	130	0.93	0.403	0.021817	1.32771	0.027373	0.96	13.46	18.36

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: WWHM Pump Station

Site Name:	6520 82nd Ave SE
Site Address:	6520 82nd Ave SE
City:	Mercer Island
Report Date:	5/23/2024
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2023/01/27
Version:	4.2.19

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data
Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	0.037
Impervious Total	0.037
Basin Total	0.037

Mitigated Land Use

Basin 1

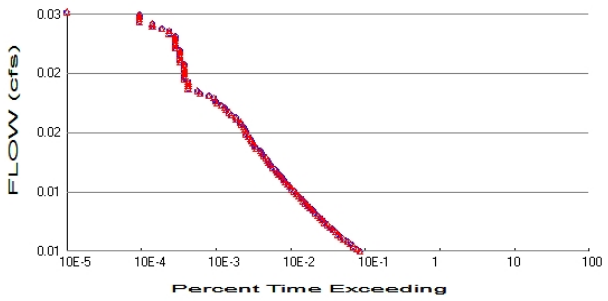
Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROADS FLAT	0.037
Impervious Total	0.037
Basin Total	0.037

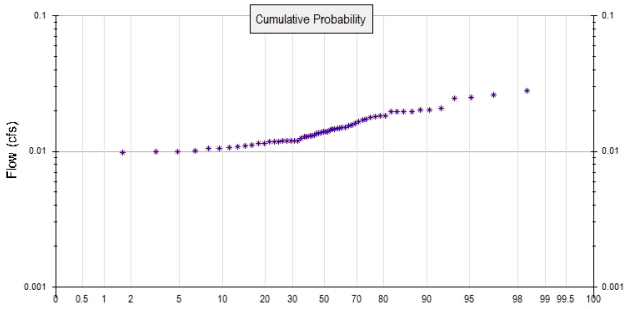
Routing Elements
Predeveloped Routing

Mitigated Routing

Analysis Results

POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 0.037

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 0.037

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.014107
5 year	0.017819
10 year	0.02034
25 year	0.023612
50 year	0.026115
100 year	0.02868

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.014107
5 year	0.017819
10 year	0.02034
25 year	0.023612
50 year	0.026115
100 year	0.02868

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.018	0.018
1950	0.020	0.020
1951	0.011	0.011
1952	0.010	0.010
1953	0.011	0.011
1954	0.011	0.011
1955	0.013	0.013
1956	0.013	0.013
1957	0.015	0.015
1958	0.012	0.012

1959	0.012	0.012
1960	0.012	0.012
1961	0.012	0.012
1962	0.011	0.011
1963	0.012	0.012
1964	0.012	0.012
1965	0.015	0.015
1966	0.010	0.010
1967	0.017	0.017
1968	0.020	0.020
1969	0.014	0.014
1970	0.013	0.013
1971	0.016	0.016
1972	0.016	0.016
1973	0.010	0.010
1974	0.014	0.014
1975	0.016	0.016
1976	0.011	0.011
1977	0.012	0.012
1978	0.015	0.015
1979	0.020	0.020
1980	0.018	0.018
1981	0.015	0.015
1982	0.021	0.021
1983	0.017	0.017
1984	0.011	0.011
1985	0.015	0.015
1986	0.013	0.013
1987	0.020	0.020
1988	0.012	0.012
1989	0.015	0.015
1990	0.025	0.025
1991	0.020	0.020
1992	0.011	0.011
1993	0.009	0.009
1994	0.010	0.010
1995	0.013	0.013
1996	0.014	0.014
1997	0.014	0.014
1998	0.014	0.014
1999	0.028	0.028
2000	0.014	0.014
2001	0.015	0.015
2002	0.018	0.018
2003	0.014	0.014
2004	0.026	0.026
2005	0.012	0.012
2006	0.011	0.011
2007	0.024	0.024
2008	0.020	0.020
2009	0.018	0.018

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0280	0.0280
2	0.0262	0.0262
3	0.0251	0.0251

4	0.0245	0.0245
5	0.0208	0.0208
6	0.0201	0.0201
7	0.0201	0.0201
8	0.0197	0.0197
9	0.0197	0.0197
10	0.0197	0.0197
11	0.0196	0.0196
12	0.0183	0.0183
13	0.0182	0.0182
14	0.0180	0.0180
15	0.0179	0.0179
16	0.0172	0.0172
17	0.0169	0.0169
18	0.0165	0.0165
19	0.0162	0.0162
20	0.0157	0.0157
21	0.0153	0.0153
22	0.0150	0.0150
23	0.0149	0.0149
24	0.0147	0.0147
25	0.0147	0.0147
26	0.0147	0.0147
27	0.0145	0.0145
28	0.0143	0.0143
29	0.0139	0.0139
30	0.0139	0.0139
31	0.0139	0.0139
32	0.0137	0.0137
33	0.0136	0.0136
34	0.0135	0.0135
35	0.0131	0.0131
36	0.0131	0.0131
37	0.0130	0.0130
38	0.0128	0.0128
39	0.0127	0.0127
40	0.0124	0.0124
41	0.0120	0.0120
42	0.0120	0.0120
43	0.0120	0.0120
44	0.0119	0.0119
45	0.0119	0.0119
46	0.0118	0.0118
47	0.0117	0.0117
48	0.0117	0.0117
49	0.0115	0.0115
50	0.0114	0.0114
51	0.0111	0.0111
52	0.0110	0.0110
53	0.0108	0.0108
54	0.0107	0.0107
55	0.0106	0.0106
56	0.0106	0.0106
57	0.0102	0.0102
58	0.0100	0.0100
59	0.0100	0.0100
60	0.0098	0.0098
61	0.0092	0.0092

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0071	1801	1801	100	Pass
0.0072	1636	1636	100	Pass
0.0074	1472	1472	100	Pass
0.0076	1342	1342	100	Pass
0.0078	1226	1226	100	Pass
0.0080	1101	1101	100	Pass
0.0082	1002	1002	100	Pass
0.0084	920	920	100	Pass
0.0086	853	853	100	Pass
0.0088	789	789	100	Pass
0.0090	725	725	100	Pass
0.0092	665	665	100	Pass
0.0094	610	610	100	Pass
0.0096	571	571	100	Pass
0.0097	532	532	100	Pass
0.0099	488	488	100	Pass
0.0101	451	451	100	Pass
0.0103	420	420	100	Pass
0.0105	389	389	100	Pass
0.0107	364	364	100	Pass
0.0109	339	339	100	Pass
0.0111	317	317	100	Pass
0.0113	296	296	100	Pass
0.0115	271	271	100	Pass
0.0117	256	256	100	Pass
0.0119	239	239	100	Pass
0.0121	222	222	100	Pass
0.0123	206	206	100	Pass
0.0124	196	196	100	Pass
0.0126	181	181	100	Pass
0.0128	171	171	100	Pass
0.0130	161	161	100	Pass
0.0132	148	148	100	Pass
0.0134	139	139	100	Pass
0.0136	135	135	100	Pass
0.0138	122	122	100	Pass
0.0140	113	113	100	Pass
0.0142	108	108	100	Pass
0.0144	105	105	100	Pass
0.0146	100	100	100	Pass
0.0148	92	92	100	Pass
0.0149	87	87	100	Pass
0.0151	84	84	100	Pass
0.0153	73	73	100	Pass
0.0155	71	71	100	Pass
0.0157	66	66	100	Pass
0.0159	63	63	100	Pass
0.0161	62	62	100	Pass
0.0163	58	58	100	Pass
0.0165	54	54	100	Pass
0.0167	54	54	100	Pass
0.0169	52	52	100	Pass
0.0171	50	50	100	Pass

0.0173	46	46	100	Pass
0.0175	45	45	100	Pass
0.0176	40	40	100	Pass
0.0178	39	39	100	Pass
0.0180	34	34	100	Pass
0.0182	32	32	100	Pass
0.0184	29	29	100	Pass
0.0186	28	28	100	Pass
0.0188	25	25	100	Pass
0.0190	22	22	100	Pass
0.0192	21	21	100	Pass
0.0194	20	20	100	Pass
0.0196	17	17	100	Pass
0.0198	13	13	100	Pass
0.0200	12	12	100	Pass
0.0201	9	9	100	Pass
0.0203	9	9	100	Pass
0.0205	9	9	100	Pass
0.0207	9	9	100	Pass
0.0209	8	8	100	Pass
0.0211	8	8	100	Pass
0.0213	8	8	100	Pass
0.0215	8	8	100	Pass
0.0217	8	8	100	Pass
0.0219	8	8	100	Pass
0.0221	8	8	100	Pass
0.0223	7	7	100	Pass
0.0225	7	7	100	Pass
0.0226	7	7	100	Pass
0.0228	7	7	100	Pass
0.0230	7	7	100	Pass
0.0232	7	7	100	Pass
0.0234	6	6	100	Pass
0.0236	6	6	100	Pass
0.0238	6	6	100	Pass
0.0240	6	6	100	Pass
0.0242	6	6	100	Pass
0.0244	6	6	100	Pass
0.0246	5	5	100	Pass
0.0248	5	5	100	Pass
0.0250	4	4	100	Pass
0.0252	3	3	100	Pass
0.0253	3	3	100	Pass
0.0255	2	2	100	Pass
0.0257	2	2	100	Pass
0.0259	2	2	100	Pass
0.0261	2	2	100	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic

Mitigated Schematic

Predeveloped UCI File

Mitigated UCI File

Predeveloped HSPF Message File

Mitigated HSPF Message File

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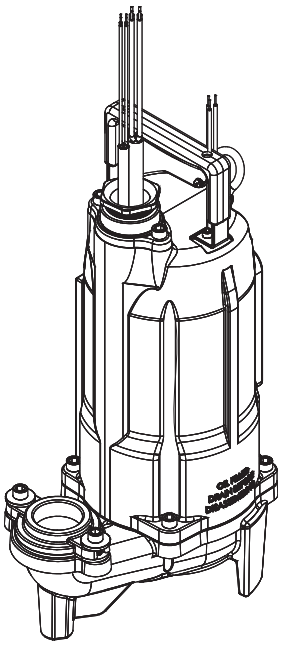
X-Series™

Pump Specification



XFL50-Series

1/2 hp Submersible Effluent Pumps for Hazardous Locations

Class 1, Division 1, Groups C and D
Class 1, Zone 1, Groups IIA and IIB

Tested at 60 Hz

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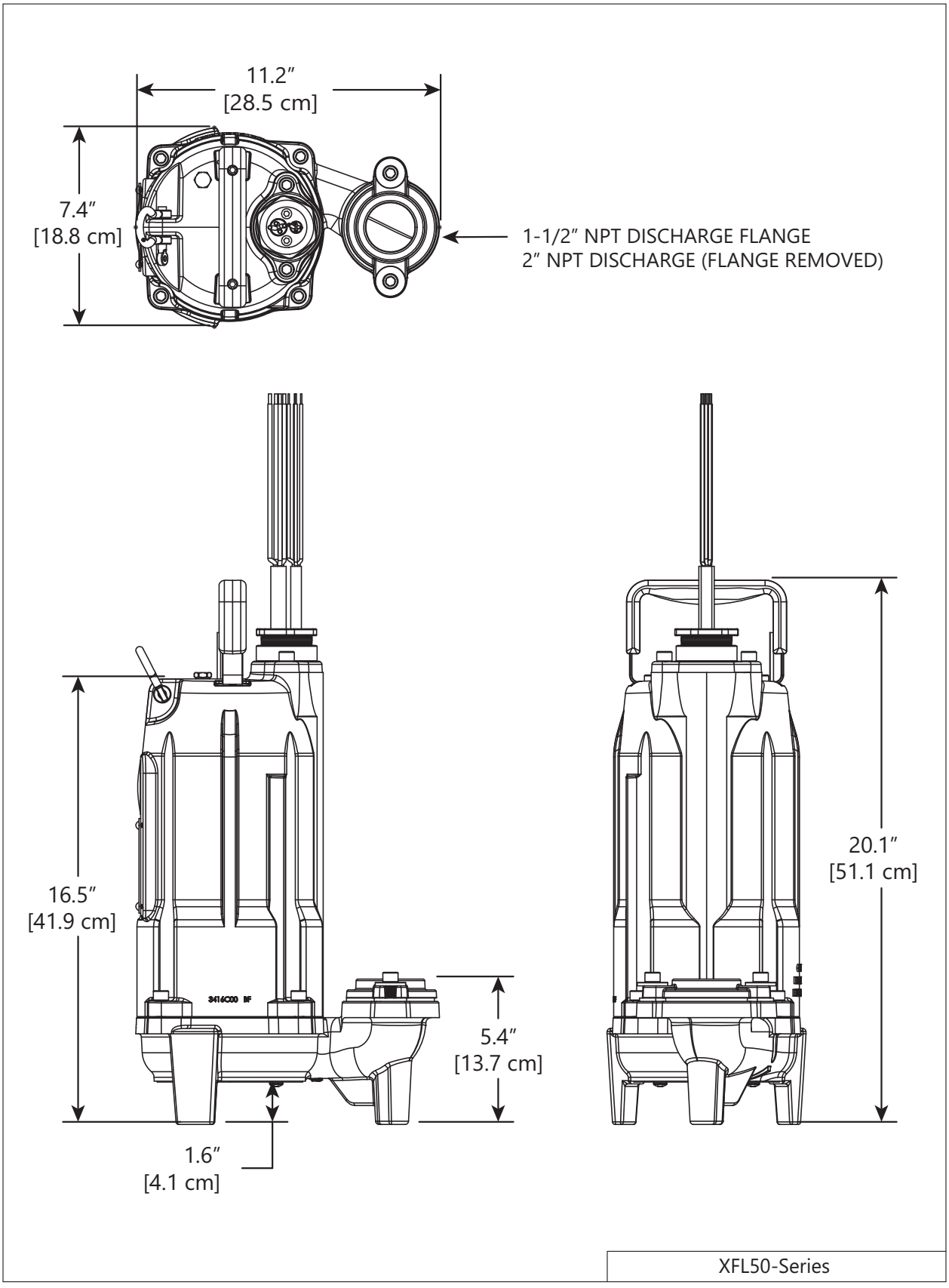
XFL50-Series Dimensional Data



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XFL50-Series Electrical Data

MODEL	HP	IMPELLER	VOLTAGE	PHASE	FULL LOAD AMPS	LOCKED ROTOR AMPS	THERMAL OVERLOAD TEMP	STATOR WINDING CLASS	CORD LENGTH [FT]	DISCHARGE NPT
XFL51M-2	1/2	CAST IRON	115	1	14	66	120°C / 248°F	F	25	1-1/2" OR 2"
XFL51M-3	1/2	CAST IRON	115	1	14	66	120°C / 248°F	F	35	1-1/2" OR 2"
XFL51M-5	1/2	CAST IRON	115	1	14	66	120°C / 248°F	F	50	1-1/2" OR 2"
XFL52M-2	1/2	CAST IRON	208/230	1	7	33.6	105°C / 221°F	F	25	1-1/2" OR 2"
XFL52M-3	1/2	CAST IRON	208/230	1	7	33.6	105°C / 221°F	F	35	1-1/2" OR 2"
XFL52M-5	1/2	CAST IRON	208/230	1	7	33.6	105°C / 221°F	F	50	1-1/2" OR 2"
XFL53M-2	1/2	CAST IRON	208/230	3	4.5	33.5	105°C / 221°F	F	25	1-1/2" OR 2"
XFL53M-3	1/2	CAST IRON	208/230	3	4.5	33.5	105°C / 221°F	F	35	1-1/2" OR 2"
XFL53M-5	1/2	CAST IRON	208/230	3	4.5	33.5	105°C / 221°F	F	50	1-1/2" OR 2"
XFL54M-2	1/2	CAST IRON	440–480	3	2.6	33.5	105°C / 221°F	F	25	1-1/2" OR 2"
XFL54M-3	1/2	CAST IRON	440–480	3	2.6	33.5	105°C / 221°F	F	35	1-1/2" OR 2"
XFL54M-5	1/2	CAST IRON	440–480	3	2.6	33.5	105°C / 221°F	F	50	1-1/2" OR 2"
XFL55M-2	1/2	CAST IRON	575	3	2.2	12.8	105°C / 221°F	F	25	1-1/2" OR 2"
XFL55M-3	1/2	CAST IRON	575	3	2.2	12.8	105°C / 221°F	F	35	1-1/2" OR 2"
XFL55M-5	1/2	CAST IRON	575	3	2.2	12.8	105°C / 221°F	F	50	1-1/2" OR 2"

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MODEL	HP	IMPELLER	VOLTAGE	PHASE	FULL LOAD AMPS	LOCKED ROTOR AMPS	THERMAL OVERLOAD TEMP	STATOR WINDING CLASS	CORD LENGTH [FT]	DISCHARGE NPT
XFL51BM-2	1/2	BRONZE	115	1	14	66	120°C / 248°F	F	25	1-1/2" OR 2"
XFL51BM-3	1/2	BRONZE	115	1	14	66	120°C / 248°F	F	35	1-1/2" OR 2"
XFL51BM-5	1/2	BRONZE	115	1	14	66	120°C / 248°F	F	50	1-1/2" OR 2"
XFL52BM-2	1/2	BRONZE	208/230	1	7	33.6	105°C / 221°F	F	25	1-1/2" OR 2"
XFL52BM-3	1/2	BRONZE	208/230	1	7	33.6	105°C / 221°F	F	35	1-1/2" OR 2"
XFL52BM-5	1/2	BRONZE	208/230	1	7	33.6	105°C / 221°F	F	50	1-1/2" OR 2"
XFL53BM-2	1/2	BRONZE	208/230	3	4.5	33.5	105°C / 221°F	F	25	1-1/2" OR 2"
XFL53BM-3	1/2	BRONZE	208/230	3	4.5	33.5	105°C / 221°F	F	35	1-1/2" OR 2"
XFL53BM-5	1/2	BRONZE	208/230	3	4.5	33.5	105°C / 221°F	F	50	1-1/2" OR 2"
XFL54BM-2	1/2	BRONZE	440–480	3	2.6	33.5	105°C / 221°F	F	25	1-1/2" OR 2"
XFL54BM-3	1/2	BRONZE	440–480	3	2.6	33.5	105°C / 221°F	F	35	1-1/2" OR 2"
XFL54BM-5	1/2	BRONZE	440–480	3	2.6	33.5	105°C / 221°F	F	50	1-1/2" OR 2"
XFL55BM-2	1/2	BRONZE	575	3	2.2	12.8	105°C / 221°F	F	25	1-1/2" OR 2"
XFL55BM-3	1/2	BRONZE	575	3	2.2	12.8	105°C / 221°F	F	35	1-1/2" OR 2"
XFL55BM-5	1/2	BRONZE	575	3	2.2	12.8	105°C / 221°F	F	50	1-1/2" OR 2"

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XFL50-Series Control Panel Information

Liberty Pumps ISS and ISD-Series panels include intrinsically safe float circuits for use with pumps in hazardous locations.

PUMP MODELS	CAPACITOR	CAP KIT	ISS-SERIES SIMPLEX PANEL	ISD-SERIES DUPLEX PANEL
XFL51	50 µF	K001515	ISS24LC1=3-5	ISD24LC2=3-5
XFL52	45 µF	K001514	ISS24LC1=3-5	ISD24LC2=3-5
XFL53	N/A	N/A	ISS34=3-171-5	ISD34=3-171-5
XFL54	N/A	N/A	ISS34=3-141-5	ISD34=3-141-5
XFL55	N/A	N/A	ISS54=3-121-5	ISD54=3-121-5

XFL50-Series Technical Data

IMPELLER	7 VANE, SEMI-OPEN CLASS 25 CAST IRON OR BRONZE
SOLIDS HANDLING SIZE	3/4”
PAINT	POWDER COATING
MAX LIQUID TEMP	40°C / 104°F CONTINUOUS DUTY
MAX STATOR TEMP	130°C / 266°F
THERMAL OVERLOAD	105°C / 221°F
POWER CORD TYPE	SOOW
MOTOR HOUSING	CLASS 30 CAST IRON
VOLUTE	CLASS 30 CAST IRON
SHAFT	STAINLESS
HARDWARE	STAINLESS
O-RINGS	BUNA-N
MECHANICAL SEAL UPPER	UNITIZED GRAPHITE IMPREGNATED SILICON CARBIDE
MECHANICAL SEAL LOWER	2 PIECE – SILICON CARBIDE / SILICON CARBIDE
MIN BEARING LIFE	50,000 HRS
WEIGHT	40.4 KG / 89 LBS
CERTIFICATIONS	SSPMA, cCSAus (60 HZ MODELS ONLY)

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1.01 GENERAL

The contractor shall provide labor, material, equipment, and incidentals required to provide _____ (QTY) centrifugal pumps as specified herein. The pump models covered in this specification are XFL50-Series single-phase or three-phase pumps. The pump furnished for this application shall be model _____ as manufactured by Liberty Pumps.

2.01 OPERATING CONDITIONS

Each submersible pump shall be rated at 1/2 hp, _____volts, _____ phase, 60 Hz, 3450 RPM. The unit shall produce _____ GPM at _____ feet of total dynamic head.

The submersible pump shall be capable of handling residential effluent with 3/4" solid handling capability. The submersible pump shall have the following hydraulic performance: shut-off head of 38 feet and a maximum flow of 96 GPM @ 5 feet of total dynamic head.

The pump shall be controlled with:

_____ A NEMA 4X outdoor simplex control panel with three float switches including a high water alarm

_____ A NEMA 1 indoor simplex control panel with three float switches including a high water alarm

_____ A NEMA 4X outdoor duplex control panel with three float switches including a high water alarm

_____ A NEMA 1 indoor duplex control panel with three float switches including a high water alarm

_____ A NEMA 4X outdoor duplex control panel with four float switches including a high water alarm

_____ A NEMA 1 indoor duplex control panel with four float switches including a high water alarm

Note: Control panels must include intrinsically safe float circuits when pumps are installed in hazardous locations.

3.01 CONSTRUCTION

Each centrifugal effluent pump shall be equal to the C SP US Certified XFL50-Series pumps as manufactured by Liberty Pumps, Bergen NY. The castings shall be constructed of class 30 cast iron. The motor housing shall be oil-filled to dissipate heat. Air-filled motors shall not be considered equal since they do not properly dissipate heat from the motor. All mating parts shall be machined and sealed with Buna-N O-rings. All fasteners exposed to the liquid shall be stainless steel. The upper and lower bearing of the motor shall be capable of handling all radial and thrust loads. The pump is protected with a dual seal configuration with an oil cavity between the two seals. A leak sensor is housed in this chamber to detect the presence of water and will activate an alarm at the control panel indicating service is required. The lower seal is a silicon carbide / silicon carbide with stainless steel housings and spring two piece design to facilitate service. The second / main seal shall be a unitized graphite impregnated silicon carbide hard face seal with stainless steel housings and spring.

4.01 ELECTRICAL POWER CORD

The submersible pump shall be supplied with 25, 35, or 50 feet of a multi-conductor cord of type SOOW, as per *Electrical Data* table. The power cord shall be sized for the rated full load amps of the pump in accordance with the National Electric Code®. A separate SOOW control cord of equal length will also exit the pump. Both cords are located within a casting configured for 1-1/2" conduit if the application requires. The cords shall be secured with a rubber seal ring and potted thus preventing any wicking through the conductors.

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5.01 MOTORS

Single-phase motors shall be oil-filled, permanent split capacitor, class F insulated, NEMA B design, and rated for continuous duty. Three-phase motors shall be oil-filled, class F insulated, NEMA B design, and rated for continuous duty. At maximum load, the winding temperature shall not exceed 130°C unsubmerged. Since air-filled motors are not capable of dissipating heat, they shall not be considered equal. Single-phase pump motors shall have an integral thermal / current overload switch in the windings for protecting the motor. A capacitor is required and shall be mounted in the control panel. Three-phase motors shall have a thermal overload device mounted on the windings that is connected to a motor control relay located in the control panel.

6.01 BEARINGS AND SHAFT

Upper and lower ball bearings shall be required. The bearings shall be a single ball / race type bearing. Both bearings shall be permanently lubricated by the oil that fills the motor housing. The motor shaft shall be made of 300 series stainless steel and have a minimum diameter of 0.625".

7.01 SEALS

The pump shall have two shaft seals with an oil chamber between them. A leak detection probe is positioned in the oil chamber and continuously monitors for water that would indicate the lower seal has failed. The lower seal is a two piece design and can be serviced in the field. The upper is a unitized graphite impregnated silicon carbide hard face seal design. The lower seal is silicon carbide / silicon carbide seal face with stainless steel housings and spring. All other seals are of an O-ring design of Buna-N material.

8.01 IMPELLER

The impeller shall be a class 25 cast iron or bronze, with pump out vanes on the back shroud to keep debris away from the seal area. It shall be threaded onto the motor shaft.

9.01 CONTROLS

All XFL50-Series pumps require a control panel. Single-phase units utilize a permanent split capacitor (PSC) type motor and require a specific run capacitor. Three-phase motors are equipped with a thermal overload that must be connected in the control panel to protect against overheating. Control panels must include intrinsically safe float circuits when pumps are installed in hazardous locations. Panels themselves shall be located outside of the hazardous location, and installed according to all state, local, and federal codes.

10.01 PAINT

The exterior of the casting shall be protected with powder coat paint.

11.01 SUPPORT

The pump shall have cast iron support legs enabling it to be a freestanding unit. The legs shall be high enough to allow 3⁄4" solids to enter the volute.

12.01 SERVICEABILITY

Components required for the repair of the pump shall be shipped within a period of 24 hours.

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13.01 FACTORY ASSEMBLED TANK SYSTEMS WITH GUIDE RAIL AND QUICK DISCONNECT DISCHARGE

_____ Factory mounted guide rail system with pump suspended by bolt-on quick disconnect, sealed by means of nitrile grommets or O-rings. The discharge piping shall be Schedule 80 PVC and furnished with a check valve and PVC shut-off ball valve. The tank shall be wound fiberglass or roto-molded plastic. An inlet hub shall be provided with the fiberglass systems.

_____ Stainless steel guide rail

_____ Zinc plated steel guide rail

_____ Diameter of basin size in inches

_____ Height of basin size in inches

_____ Distance from top of tank to discharge pipe outlet in inches

_____ Fiberglass cover

_____ Structural foam polymer cover

_____ Steel cover

_____ Simplex system with outdoor panel and alarm

_____ Duplex system with outdoor panel and alarm

_____ Simplex system with indoor panel and alarm

_____ Duplex system with indoor panel and alarm

_____ Separate outdoor alarm

_____ Remote outdoor alarm

14.01 TESTING

The pump shall have a ground continuity check and the motor chamber shall be hi-potted to test for electrical integrity, moisture content, and insulation defects. The motor and volute housing shall be pressurized and an air leak decay test performed to ensure integrity of the motor enclosure. The pump shall be monitored for run voltage and current, and checked for noise or other malfunction.

15.01 QUALITY CONTROL

The pump shall be manufactured in an ISO 9001 certified facility.

16.01 WARRANTY

Standard limited warranty shall be 3 years.

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Liberty Pumps®

GR-Series

Guide Rail System

Features:

- 2" or 3" discharge FNPT
- Heavy cast iron construction
- Rugged one rail design with auto-guide feature
- 1-1/4" guide pipe FNPT (guide rail pipe not included)
- Heavy duty nitrile sealing grommet
- Upper cast iron rail support bracket provided
- Powder coated for corrosion resistance

"NS" non-sparking models feature a bronze claw for installation in hazardous locations and fitment with X-Series pumps.

Models available fit:

FL, LE, LEH and X-Series Pumps

innovate. evolve.

GR-Series Guide Rails

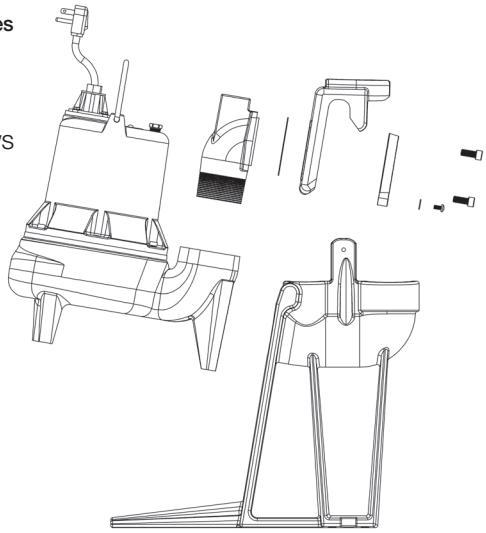
Specifications and Dimensional Data

Material: Class 25 Gray Cast Iron (Bronze claw on "NS" models)
Weight: GR22 – 38 lbs. GR30 – 46 lbs.
Seal: Heavy Duty Nitrile
Rail Size: 1¼" (Not Included)
Discharge: GR22 – 2" Female NPT, GR30 – 3" Female NPT
Maximum Pump Weight: 250 lbs.
Upper Rail Support: Class 25 Gray Cast Iron
Rail Support Bolts: Stainless Steel

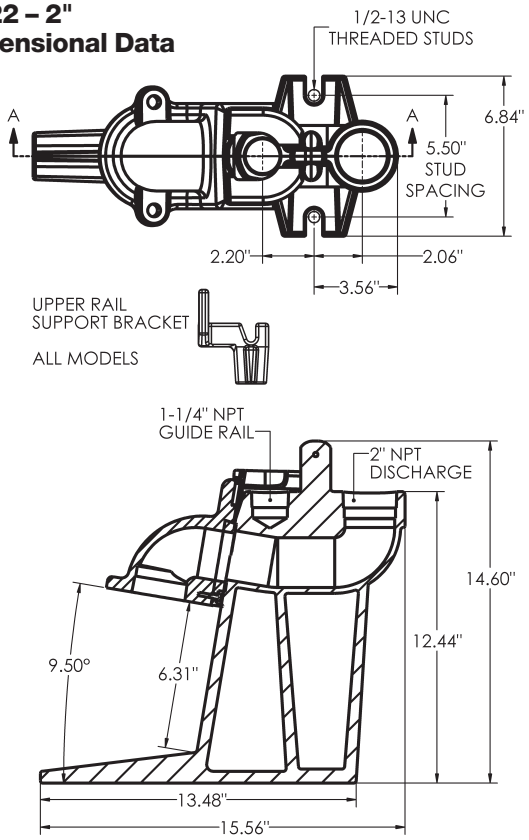
MODELS:	*DISCHARGE*	*SERIES*
***GR22-FL**	2"	FL50, FL60, FL70, FL100, FL150, FL200
***GR22NS-FL**	2"	XFL50,XFL70, XFL100, XFL200
***GR22-LE**	2"	LE70, LE100, LEH100, LEH150, LEH200
***GR22NS-LE**	2"	XLE50, XLE70
GR22-S	2"	LE40, LE50
GR30	3"	LE70, LE100, LEH100, LEH150, LEH200
GR30NS	3"	XLE50, XLE70, XLE100, XLE150

*2" internal female thread on pump mating claw allows for mounting to other pump makes

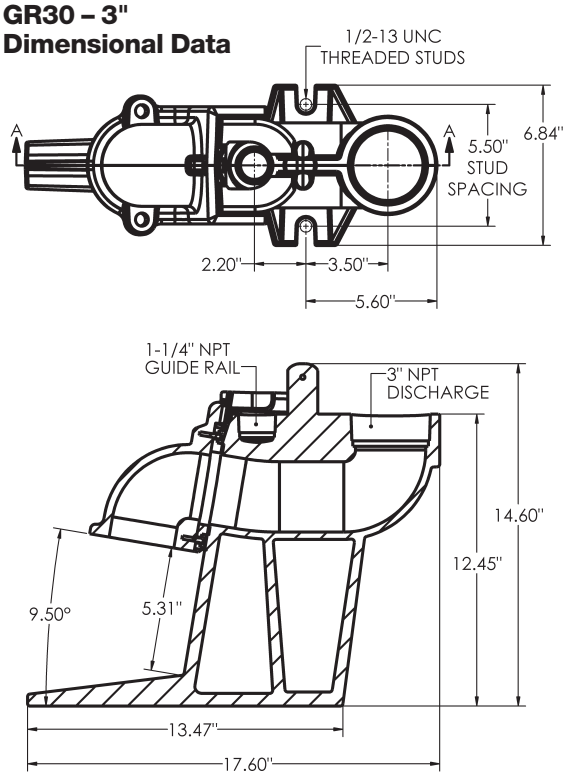
GR22-S
Split pump claw allows fitment to LE40 and LE50 – Series



GR22 – 2" Dimensional Data



GR30 – 3" Dimensional Data



Specifications are subject to change without notice.

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